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THE COLOR COMPUTER MONTHLY MAGAZINE

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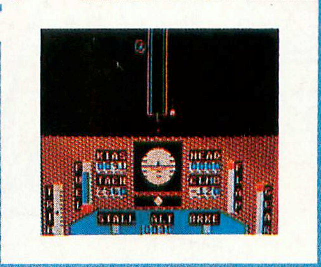

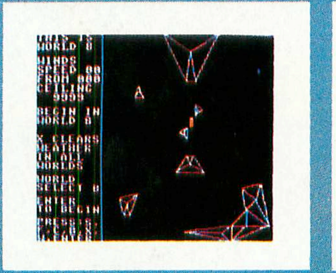

```
THIS IS
WORLD 0

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SPEED 00
FROM 000
CEILING
  9999

BEGIN IN
WORLD 0

X CLEARS
WEATHER
IN ALL
WORLDS

WORLD
SELECT 0

ENTER
TO BEGIN
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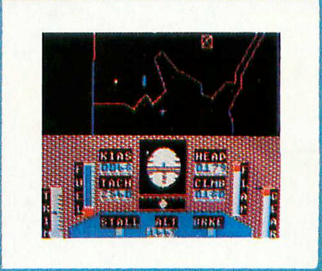

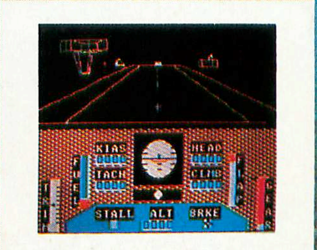

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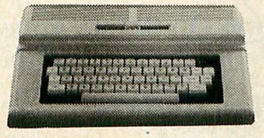
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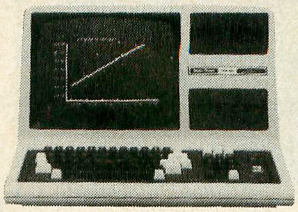
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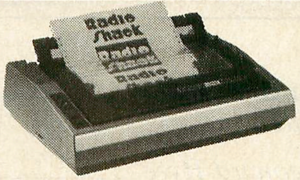
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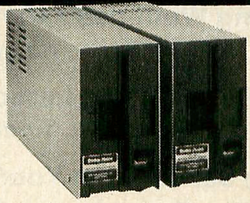
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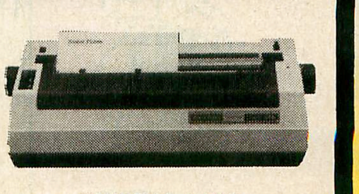
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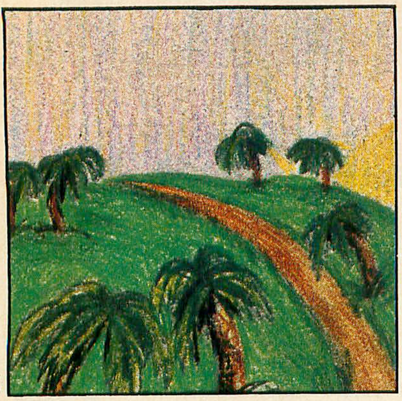

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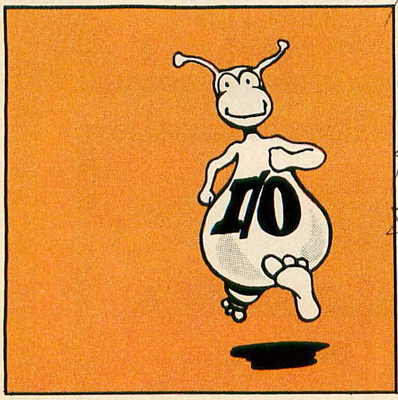

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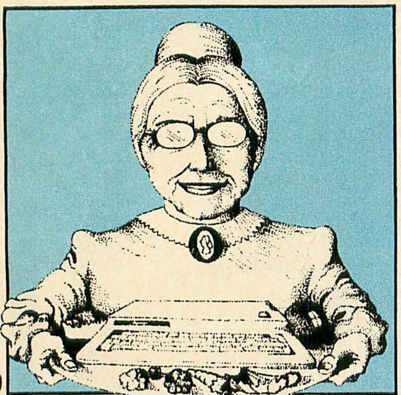

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NEXT MONTH: September is back to school time, which means THE RAINBOW will emphasize education for students, parents, and teachers. From a lesson on how to tell time to a lesson on making Simulation games, THE RAINBOW will give you the ABCs of the classroom and the CoCo. We'll have word puzzles, a math logic program, a quiz on past presidents, two educational columns, as well as our usual colorful blend of programs, tutorials, games, utilities and reviews.

Look for the September RAINBOW for more on the Color Computer than is available from any other source.

📼 The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE, ready to *CLOAD* and *RUN*. For full details, check our RAINBOW ON TAPE ad on Page 126.

ER art © by Fred Crawford

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August 1984 Vol. IV No. 1

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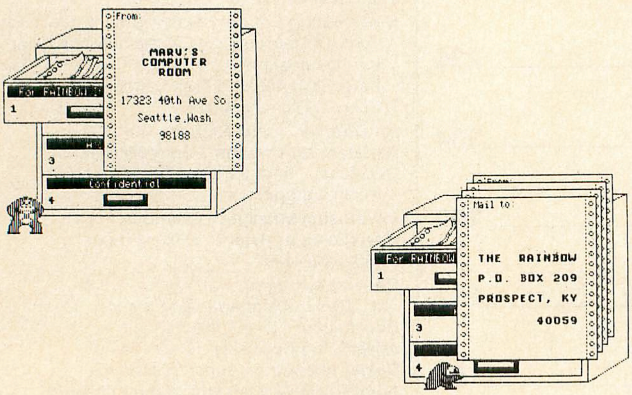
LETTERS TO THE RAINBOW

ARTS AND LETTERS



Envelope Of The Month

Marv Swan
Seattle, WA

A FLOWERY THANKS

Editor:

On behalf of the entire Garden State CoCo Users Group, we would like to thank THE RAINBOW staff for the excellent job they did with the New Brunswick RAINBOWfest. All the seminars were very helpful, the exhibitors were very friendly, and best of all, it was great meeting all the other CoCo users from around the U.S. Our group was very happy to help THE RAINBOW by manning a booth, and distributing posters and T-shirts. We are all looking forward to the Princeton RAINBOWfest.

Darren Nye, Secretary
Garden State CoCo Users Group

Editor's Note: We appreciate all your club did to make it a successful show.

HINTS AND TIPS

Editor:

If anyone ever asks you why their printer will not work on the Color Computer you can be nearly certain that the reason is that pin two on the serial I/O port is not being held high by the printer. I got the clue to this from reading the green technical manual put out by Radio Shack, which I was given at my local Radio Shack store when no one there knew the answer. For anyone making a cable, here is the way to do it.

Buy a cable with four pin connectors on each end from Radio Shack and cut it in two. Splice to one of these four-pin half cables a standard 25-pin D.B. plug and connect the following pins.

From the computer:	On the printer side:
pin 1 not used	
pin 2 green receive	pin 20 or any other +12
pin 3 red signal ground	pin 7 signal ground
pin 4 white send	pin 3 receive

The technical manual defined "high" as above three volts but I found that even an eight- or nine-volt line would not work. Most printers will have a pin 20 output which is 12 volts, and if not they generally will have another pin with +12 which will do just as well. It is a little peculiar that the computer's receive pin instead of its carrier detect pin is the one needing to be held high, but every machine has its idiosyncracies. And it took me a while to find this one, so I thought you might appreciate my passing it on.

Caution also on print speeds chosen (with the above-mentioned corrections) since the CoCo has no busy detect. So if it sends data faster than your printer can print it or buffer it, you will lose text.

Tom Lott
Savannah, GA

Editor:

You can turn your CoCo into a jukebox if you *CSAVE* the ML program generated by *Composer* or *Music+*.

1) Save each ML program to tape, leaving a short blank between them.

2) Press Reset if you have turned *AUDIO ON*. Typing *AUDIOOFF* or *NEW* or deliberately creating a SN Error won't do. The ML program will *EXEC*, but with no sound.

3) In the command mode type *FOR T=1 TO* number of tunes on the tape: *CLOADM: FOR R=1 TO* number of times to repeat each tune: *CLSRND(8) :EXEC :FOR P=1 TO 700* a short pause *:NEXT :NEXT :NEXT.*

4) Rewind tape, press *PLAY* then press ENTER.

The above can also be entered and run as a BASIC program, with an *ON T GOSUB* to some graphics routines instead of *CLSRND(8).*

Composer music will not load into *Music+*. But all that work is not lost. *CSAVE* ML music from both programs on an all music tape. The above program will *EXEC* them all.

Now your CoCo sounds like an organ, works like a record player, with colors for flair.

I hope you will put more music in RAINBOW ON TAPE. *CTRYROAD* is number one on my Top 40.

Your magazine is the greatest!

Robert H. Little
Utica, MS

IT'S A CHECK PLUS

Editor:

I am one of your subscribers and I have been wondering for a while about a rectangle with a check mark and a lot of numbers. I have tried to unravel the mystery but I have not been albe to do so.

Will you please indicate to me if there is an explanation to what is inside the rectangle or if it is just some numbers without any explanation.

Editor's Note: Please read "Rainbow Check Plus" under RAINBOW Info on Page 73 of this issue for a full explanation.

BOUQUETS AND BRICKBATS

Editor:

I want to compliment two of your advertisers. One is Computer Plus for their super fast shipments to a very impatient CoCo owner.

The other is VIP Software. I doubt that there is anyone that has such a feature packed word processor for such a low price. To make it even more amazing, they "throw in" a 50,000 word speller at no additional cost.

Paul Frank
Buffalo Grove, IL

Editor:

I was most interested to read the letters from Joe Cain and John Spataro in the May 1984 issue, Page 206, because I have encountered some of the same problems with *VIP Terminal.*

Like Mr. Cain, I suffer from considerable loss of data when I use the default 51 characters-per-line screen which was one of the main reasons I bought *VIP Terminal.* And like Mr. Spataro, I encountered the same lack of interest on Softlaw's part when I tried to get some help.

A full month after I wrote to Softlaw, I received a form letter telling me that my question could be answered only if I would call them at an inconvenient hour of the afternoon. I found it rather difficult to understand how the manufacturer of *VIP Writer,* a truly excellent word processor, would be unable to communicate by letter. But in the interest of getting the problem solved, I managed to be near a phone at the proper hour one day and I called.

I spoke to Mr. Tom Saag of Softlaw's customer relations department. He was somewhat unsympathetic, and only moderately helpful. He suggested I ask the Bulletin Boards and databases with which I communicate to send nulls for line delay. But that is only a partial solution, because many of these services, including MCI Mail, are not equipped to send nulls.

I find it highly significant that Cer-Comp, in its advertisements for its new *Data Pack II* terminal program, puts "No lost information when using Hi-Res display on line" *first* on the list of features. On top of that, *Data Pack II* seems to have all the same bells and whistles that *VIP Terminal* has, and it has a buffer editor that *VIP Terminal* lacks — all for $15 less! Obviously, Cer-Comp found that a problem existed and did something about it. Why can't Softlaw do the same?

In its own advertising, Softlaw likes to emphasize its "professionalism," but the company is anything but professional in its treatment of its customers.

Neil Edward Parks
Beachwood, OH

GOOD SUPPORT

Editor:

I would like to publicly thank Software Support Inc. for their honesty and responsiveness in handling my disk drive order and the ROM change that was needed on it. "Support" is, in fact, their middle name. I hope all CoCo product companies follow their example.

Robert Shepard
Versailles, KY

Editor:

I recently ordered a program tape called *Custom Flashcards* from one of your advertisers, Creative Technical Consultants. After it arrived, I found that it took two or three tries to get past an I/O Error and get it loaded. I wrote the company and within two weeks I received a new *Custom Flashcard* tape, along with a 50 percent discount coupon "by way of apology for any inconvenience the defective tape may have caused me." The new tape works fine and the program is just great. I used the coupon to order another one of their programs called *Alphabet Soup,* and it worked perfectly too. (Now if I can just get my kids to quit playing *Alphabet Soup* long enough for me to study my *Flashcards*...) Anyway, it's great to deal with a company that cares about their product and my "inconvenience."

J.W. Abel
Denver, CO

SPREADING THE WORD

Editor:

Let me express my appreciation for the quality of RAINBOW. It by far outshines all other CoCo publications on the market.

I am the pastor of Grace Covenant Church in St. Louis. We are a small church, presently meeting in a home. I am writing to express a need we have for a printer. I have a 64K CoCo which I intend to use for word processing. It will be used for sermons, writing Sunday school materials, printing articles, and typesetting leaflets and tracts. Because of the size of the church, neither I nor the church can afford to purchase a printter at this time. I am hoping that one of your Christian readers might consider donating a printer to us, or selling us one at a low price. Your donation would be used for the glory of God. Please contact me at Grace Covenant Church, P.O. Box 1165, 63011 or call (314) 227-3238.

Pastor Mark S. Camp
Ballwin, MO

INFORMATION PLEASE

Editor:

I am an avid reader and user of RAINBOW magazine (the best of all the ones for the TRS-80). I've been wondering for quite some time if there is a Bible Concordance program availabe for disk? Write to: 7031 9th Avenue, H2A 3B5.

Dick Svendsen
Montreal, Quebec

LOOKING FOR POKE

Editor:

My friend and I are working on a computer program and we were wondering if there was a poke to disable the reset command. Also, we would really appreciate it if you knew if there was a poke to immediately make a program run afer CLOADing it. Thanks for any information you can possible give us. 125 Guinea Road, 04005.

Marc Labbe
Biddeford, ME

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GRAIN OF AN IDEA?

Editor:

We have a TRS-80 CoCo 2 and have found our best source of program has been your magazine. We have enjoyed the games and business programs.

There is a type of program we haven't been able to find. We are grain farmers and we would love to be able to use our computer more in our farm operations. We are looking for any program that would help us with grain farm management.

If you know of any programs or any other farmers that might know of some programs, we would like to hear from you. RT #2, 83420.

Dennis Rogers
Ashton, ID

A REAL SCOUT

Editor:

I would like to inform your readers of my experience with a program that I have not seen reviewed anywhere. A few months ago I purchased *Compu Scribe B.S.A.* from Color Connection Software. The ad states you can keep tabs on the whole troop, and create a printout by scout rank or alphabetically. This is true and looks rather impressive, especially if a scout has really worked hard. The program is rather worthless though because there are no provisions for keeping track of dates of advancement or when merit badges were earned. So, in effect, you must still keep another set of books. The program might be more effective if the 132-character format were eliminated and more space provided to allow for more information on the other half of the page.

I would like to install a video buffer and am confused about the new chip numbers in CoCo 2. I am running two Radio Shack drives, a DMP 120 printer and a modem I.

I would be interested in hearing from readers who may have modified *Compu Scribe* or have other useful programs dealing with scouting or those who have added a video buffer to their CoCo 2. What buffer did they use? Write: P.O. Box 321, 45390.

Paul McKee, Jr.
Union City, OH

Editor:

I would like an opinion on two printers, the Okidata 92 and the Gemini 10X. I have seen both of them print and I lean toward the Okidata 92.

Could you please give me your opinion on which printer would be best suited for use with the CoCo 2 and which would be best supported by software available for each printer.

William C. Mulvey
Patchogue, NY

Editor's Note: The Okidata ML 92 was reviewed in the October 1983 (Page 227) issue of THE RAINBOW. The Gemini 10 was reviewed in June 1983 (Page 109) while the Gemini 10X review appeared in the June 1984 (Page 265) issue.

PIGGYBACK BLUES

Editor:

Help! Back in the legendary days of the "D" board, memory upgrades were mysterious and awesome. Financial and technical considerations led some of us into the realms of piggy-back 32K. By now everyone knows that this creates the obscure memory-overlay syndrome. The problem is what to do about it! Simply put, when encountering programs that combine BASIC and ML across the 16384 border in this modification, anything can happen! Some work, some don't, and some frustratingly partially work before the dreaded (most frequently) FC Error message occurs. If you stick to BASIC everything is fine, but addressing the ML seems to be up for grabs. The standard answer seems to be "get good 64K chips," but for nonelectronic types, 64K for the "D" board is fearsome, not to mention expensive for those who started with 4K and have scrimped for those chips and other needed peripherals. I find it hard to believe that the only answer for the "piggy-back" owners is "tough luck, buddy!"

Maybe the vendors of this modification have a fix, or more likely, other owners with a technical bent have found one. If so, publish! Many programs sit in my inactive box because of this glitch and I am sure there must be others in the same situation out there in CoColand. Write me: Box 28, 61426.

Richard Gordley
Castleton, IL

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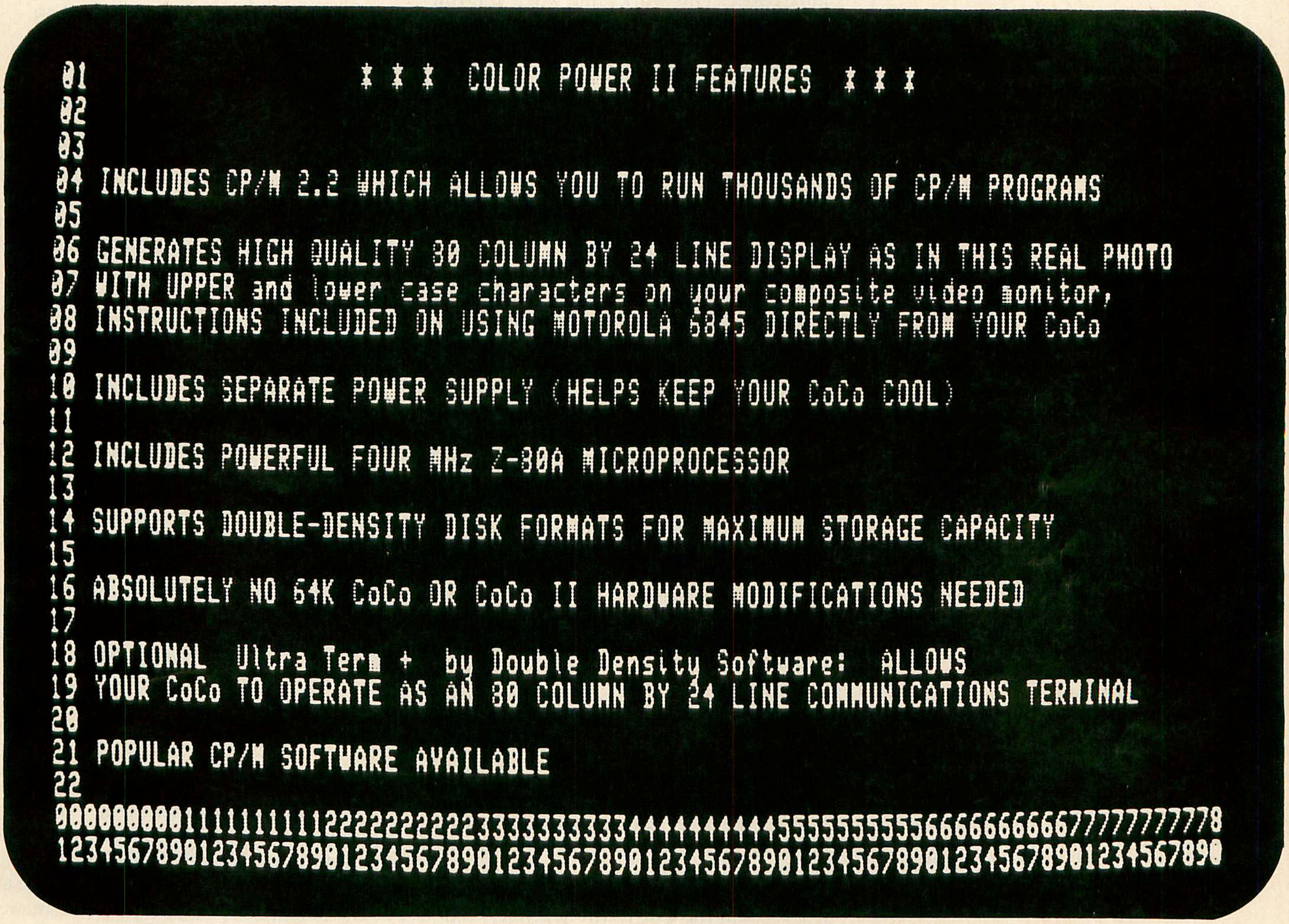

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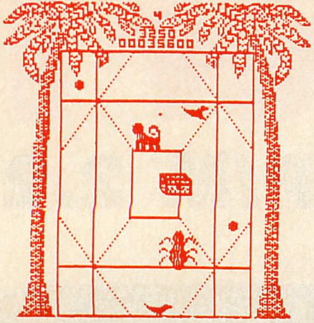
MEGAMUNK



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Editor:

Has anyone out there ever heard of the Impact Data Printer Company or know where we can get replacement ribbons for their printers? We have an Impact Data model 800 printer with its ribbon in shreads from overwork. It requires a 1-yard loop of cloth ribbon and no one we have talked to at major office and computer supply stores has ever even heard of a ribbon like that. It is getting to be a headache to slide carbon paper into the printer between the sheets of blank paper. This works fine when you run out of ribbon but gets tiresome after a while. I also would like to know: does anyone know of a screen dump for these printers? They print no graphics characters — just alphanumerics and punctuation.

Rogers George, IV
Terrace, MN

KUDOS

Editor:

I have read the many plaudits that you receive in the "Letter's To Rainbow." You deserve every one and I can only add a job well done unless I take a different tact.

Our grandson, since receiving RAINBOW, has gone to the head of his class in typing as well as improving his grades in all other classes at least one full grade letter point and in some subjects more. His mother tells me he has gone from a C- average to a B+ average overall. His reading comprehension has improved tenfold. Your subscription rate is a small price to pay for this improvement in his overall education.

Even if you have a sore arm, pat yourselves on the back just once more for me.

Alex M. Parker
Central Valley, CA

Editor:

THE RAINBOW is tops. Every once in a while I'll glance at another, but as it's been said so many times and by so many people, there's none other that compares. THE RAINBOW is my only source of information on the CoCo.

Continue the excellent work. I am a true believer that the CoCo will never get cold!

Daryl Judd
Nampa, ID

Editor:

Thank you for producing such an informative, comprehensive magazine. Richard White's "Marrying Machine Language to BASIC" (May 1984, Page 31) was the most informative article I have ever read in any computer magazine. After becoming proficient at BASIC, the average CoCo user faces a difficult task in attempting to learn machine language.

Mr. White's contribution has provided us with a basic understanding of how machine language works and some direction in finding the proper sources for reference. More articles aimed at the machine language learner would be greatly appreciated; especially anything that would clarify the infamous "Hidden 32K" and the difference between "C" and an assembler!

Ralph M. Greco, Jr.
Providence, RI

EVALUATORS NEEDED

Editor:

I have developed a federal income tax program and would like to have it evaluated by some of your readers. In exchange, they may keep the program. All CoCo system configurations are needed. Write me at: Alpha Byte, 1008 Alton Circle, 29501.

John M. Gregg
Florence, SC

BULLETIN BOARD SYSTEMS

Editor:

I would like to inform your readers of a CoCo BBS in the 312 area code. It is called Cream De CoCo BBS. It can be reached at (312) 597-8485. Erik Thred is the Sysop of the BBS. It also has downloads for the CoCo. Call today!

Darren O'Neill
Palos Heights, IL

Editor:

It is with great pride that I announce the start of a new bulletin board service called the Next Step Board. The board supports member messages, downloads, uploads, and other general interest categories. It is a full support board for *Pro-Color-File* by Dennis Derringer. Owners of the program can contact other owners and converse at will. We also support the Pro-Color-File Users Group headed by Jorge Mir. There is a special section set aside especially for these members.

We support *Colorcom/E(C)* and *Videotex(C)*. Call (213) 690-4589. We may just have the program you have been looking for.

Paul L. Kush (SYSOP)
Yorba Linda, CA

A CLEAN DREAM

Editor:

I had a dream the other night. I was buying a washing machine. The salesman told me how powerful this machine was, the many features it had, how it could handle all sorts of tasks and how it would be the answer to all of my needs.

I was impressed until I asked about the warranty. I was told that it was sold as is. However, the manufacturer did guarantee that I would be able to load it. It was not warranted to be free from defects and it was not warranted as to whether or not it would wash clothes. I was also cautioned that before I used this machine I should make a duplicate so that if anything happened I would have a backup. I was also told that if something should happen and I needed information that there would be an additional fee.

I awoke with a start. I thought about the reason for such an odd dream when I realized that the day before I had purchased some software. Ridiculous, isn't it?

Juit M. Divet
Tacoma, WA

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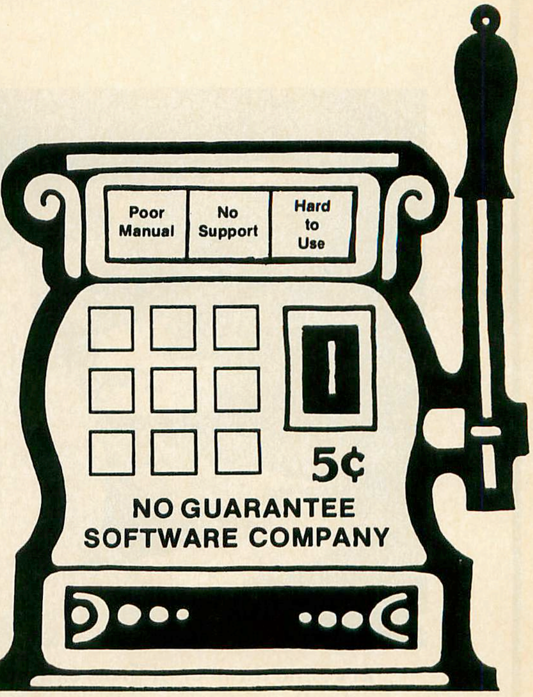

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- Embedded commands center, tab and line skip.
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- No "Database Adventure" - over 50 page manual.
- Manual includes program operation flowcharts.
- Not needed, but included is user modification section.
- Access up to 4 drives in disk version.

- Create new files from all or part of old file.
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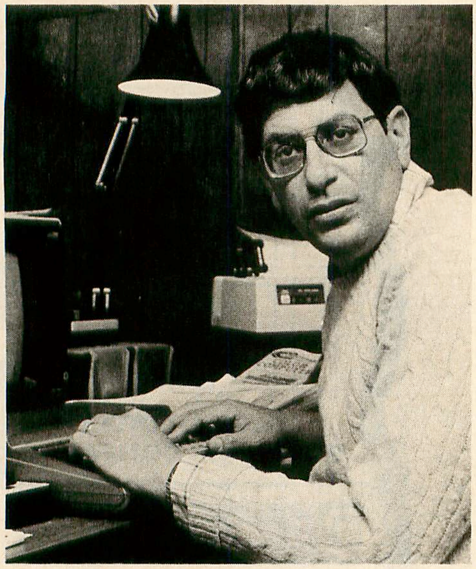

I sure hope everyone's nose has recovered from our Scratch And Sniff Adventure last month. We *certainly* did get a lot of response, and all of it was good. Or, at least, most of it was good. One lady called in saying that she stayed up late typing the whole program in, caught a cold, and wasn't able to smell the scents. Well, we're easy. We told her what they are. I guess she's happy now!

We did attract some attention in the media for the Scratch And Sniff Adventure, and we plan to be doing some more "wild and crazy things" as time goes by. That, to my mind, is what is nice about CoCo — while you can use it for a whole range of significant applications, you can have a lot of fun with it, too. Perhaps this is the reason CoCo is still there and going strong while virtually all the "highly-touted" home computers have bitten the dust. It is called a "shakeout," but maybe we should call it a "Shackout," because guess who is shaking the others out of the market?

Our RAINBOWfest in Chicago was a huge success: the largest of the shows we have had — both in terms of attendance and number of firms exhibiting. Are we doing it again? You bet! And what we'd like to see is you folks in other parts of the country trying to beat the Chicago attendance record. The east held it for a time, but the midwest came storming back. And, how about you westerners? We'll be back in California in February.

I know no one cares but me, but RAINBOWfest in Princeton, N.J., (Sept. 28-30) is the week before my birthday. And, while most people who start getting a little older like I am try to forget their birthdays, I have always had this thing about the occasion. So, we're planning something a little special for what Jim Reed has dubbed as "Lonnie's Birthday at RAINBOWfest." I hope you will come and help me celebrate in Princeton.

Yes, the rumors have been flying about a new Color Computer. Will there be one? Of course. But don't expect anything anytime real soon.

We can't tell you a great deal at this point, but one of the things we *can* point out is to expect "upward" software compatibility with the new CoCo. That means that what you see running now will be able to run right away on the new machine — or will require only a little modification. Contrast that, if you will, with Commodore's dumping of the VIC-20 when the Commodore 64 became available. And, when Commodore tried to do it again a few months ago, there was such a hue and cry from users and dealers that they have gone back and looked at the whole issue again —significantly delaying the introduction of the new machine.

While *some* changes are necessary in bringing out a new model, you don't see this planned obsolescence from Radio Shack. Perhaps that's why Radio Shack is the "shaker" instead of the "shakee" in the home computer market.

Thanks to a friendly computer store in the area, I have been playing with a Macintosh computer for the past several days. I am sure most of you have seen or heard something about this one — from our friends at the Apple Computer Company.

I have seen the Macintosh — known as the Mac among friends — at three or four shows now, always with an extra-big projection TV and a lot of people looking. (In fact, at the West Coast Computer Faire in San Francisco, it was a little hard to get into the main exhibit hall because doors were narrow and the Mac exhibit was right in front of them.)

Mac addicts (at this point, mostly Apple people and dealers and the people who are planning the software for this new addition) are touting the Mac as the newest and greatest thing since sliced bread. I thought you might be interesed in some observations, so here we are.

I do not see the Mac as a particularly great computer. I *do* see the software as a major innovation in user-friendliness. In fact, for the most part, the software is not only user-friendly, it is user-affectionate. Mac uses 3½-inch disks, similar to those with the AMDISK system available for the CoCo, and each one (single-sided) holds a little over 400K. That sounds fine, except the system and applications software take up a lot of space. To do word processing for instance, I can clear about 160K on my disk. Not bad, but not great, either.

The single worst thing about the Mac is the disk drive access. It is s-l-o-w. If you think *any other*

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The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
> — Color Computer News, Jan. 1982

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But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

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64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

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One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

RAINBOW
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File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

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Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
> — The RAINBOW, Jan. 1982

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Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

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(Continued from Page 12)

system is slow, try Mac. Those disk drives grind and grind and grind. Oh, for some fast I/O!

Too, Mac is a black and white computer. There is no mention anywhere of color — coming or available at some future time. To some degree, this really does not upset you as much as you would think: But, given an absolutely fantastic graphics package called *MacPrint,* it is a shame that the people who pioneered color computing end up now with a one-color computer. And, the resolution in the graphics mode (and it is always in the graphics mode) is less than CoCo. Hmmmm.

One of the things which is important is the "footprint," that is, the amount of space the Mac takes on a desk. Basically, the footprint is rather small, but, if you add the need for space in which to operate the "mouse" (more on this later), it is pretty big. The disk drive is built in, but that is only for a single drive. The second has to be outside the computer. Given the small amount of available storage on a single disk after the applications are added, you almost have to have a second drive (not yet available).

If you get the idea that I am not particularly impressed with the Mac, you are right. And, at $2,500 (plus $500 for a C.Itoh graphics printer) that's a hefty price, in my humble opinion. You do get *MacPaint* and *MacWrite* (a word processing package) with the computer but BASIC costs extra (like, $199 extra).

As much as I *am not* impressed by the Mac, I *am* impressed by the software! This stuff is super. I do not go so far as to say it is the answer to interfacing people and computers, but it makes a giant step.

As I mentioned, everything involving the Mac is in a graphics mode. It uses a "desktop" in which your programs and/or applications are graphically represented on the screen. Your major tool is the mouse, and you can use it to select different applications, rearrange the desktop, make each "window" larger or smaller, scroll and the like.

All of this is super. It really is. One of the major assets is that you do not have to remember a bunch of commands to do things like save programs, edit letters, draw lines and the like. Instead of typing *SAVE* "LETTER" all you have to do is move a pointer controlled by the mouse to a label at the top of the screen which reads "File" and then move the pointer down (again with the mouse) until the word *SAVE* is highlighted. You press the mouse button and the save starts to take place.

Oh, oh. A screen comes up asking you what you wish to name the document. All of a sudden, you have to get to the keyboard and type it in. This means, in effect, switching from the mouse to the keyboard. To my mind, this is a fault of the system.

Let's take word processing — an application a whole lot of people use a computer for. You have to use the mouse to get yourself into the word processor, use the mouse to set margins and the like, and then go to the keyboard, just like always. It seems to me you are switching systems.

Oh, yes, the word processor is nice. It lets you type in nine different type styles, six different types (like underline, italics and so on), and in five different sizes. But, if you want to change from "regular" type to underline, you either have to "leave" the keyboard and go to the mouse to make these changes, or you have to *memorize a bunch of control keys*!

My point, exactly. Mac is billed as a computer system where you do not have to memorize things. Yet, it is abundantly easier to memorize Control-I to get italics than to take your hands off the keybaord, move the mouse around and then do some clicking of the mouse button.

I see this as a fallacy in the entire system. While the graphics program works extremely well with the mouse, you still need to go to the keyboard to label anything. In the edit mode of the word processor, you are basically going back and forth between the mouse and the keyboard. It drives you nuts.

Maybe it is me. I am used to computers and feel comfortable with the commands. I've memorized most of them so long ago that I do not realize I have memorized them. But, it does bother me to have to switch back and forth between the mouse and the keyboard. And, especially when I want to edit, it is frustrating not to have cursor keys on the keyboard itself. In word processing the keyboard is where it's at — not the mouse.

Let me suggest three things. First of all, go take a look at the Mac. I *do* think you will be impressed with the total concept. I know I am. Spend a few minutes playing. And, then, looking at things objectively, I believe you will be able to see past the gee-whiz and discover some of the problems this sort of system brings about.

Second, let me ask you to consider that the Tandy 2000 machine will soon have a mouse available, along with Microsoft's *Windows* program. The 2000 costs less than the Mac, and can do oh, so much more!

Third, and most important here, I wish to remind you that there are some applications which can use, in a very effective way, the graphics capabilities and the mouse that Apple has used in making its Mac. And, remembering that all it takes is software to do this, I believe some very excellent programs can be (and are being) developed for the Color Computer (which already has a mouse, too, along with better graphics) using this concept.

Then, you have a *truly* excellent opportunity to teach people to get friendly with a computer —using the same techniques applied by Mac — without sacrificing any of the ease flexibility necessary in keyboard-necessary applications. Just as will appear with the Mac, I foresee a whole range of programs made available to use mouse "technology." But, by using CoCo, we will have them at a fraction of the cost, in color — and on a superior computer, too!

— Lonnie Falk

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BUILDING AUGUST'S RAINBOW

Starting Our Fourth Year . . .
The Annual Games Issue . . .
And, Some Comments on Reviews . . .

For a short but memorable tenure quite a while ago, I worked backstage at NBC Burbank as a security guard assigned to *The Tonight Show*. Both starstruck and awed by the power of network television, I reveled in my good fortune at having the opportunity to peek behind the curtains of what is probably the world's most famous TV show. Over the past two decades, Johnny Carson has developed such a following it's reported — and who would doubt it — that, at the conclusion of his monologue, the pressure in water mains across the country drops as people scramble to America's kitchens and bathrooms during the ensuing commercial break.

I was reminded of that "Johnny phenomenon" recently when one of our major advertisers told me that his sales drop conspicuously each month in the week right before THE RAINBOW comes out, then pick up noticeably when the next issue hits the mailboxes and newsstands. Also, he reports that THE RAINBOW's reviews of his company's products can bring feast or famine, depending on the reviewer's conclusions. This underlines to me the importance of THE RAINBOW review process.

Each month, we agonize over the two to three dozen reviews published in THE RAINBOW. We are not cavalier about the responsibility we have: to the software/hardware marketing company, to the reviewer, and, most importantly, to our readers. To ensure impartiality and objectivity, the review process has become quite tedious. To begin with, we do not accept unsolicited reviews: the theory being that many of these come from those with either a bone to pick, or, possibly a vested interest. Rather, we have a stable of reviewers whose qualifications and interests — and affiliations — we know. Jutta Kapfhammer, our submissions editor, makes a determined effort to match review material with those most qualified to review it. (This is more difficult than many imagine, and, if you think we need your expertise, write her.) Our reviewers do it for love, not the token expense money, and they must follow extensive guidelines under the pressure of hard deadlines. They respond like troopers and put their hearts in it. Therefore, once a given item is assigned for review, we feel a strong commitment to edit the resulting review as little as possible in order to preserve the integrity of the review process and give the reviewer his rightful say.

In recent months, however, we have elected to give companies a chance to respond — in the same issue — if we feel there may be strong exception to our reviewer's conclusions; this is the purpose of our "Reviewing Reviews" section — to state the other side of the case, so to speak, and to clear up any possible factual errors before they might cause irreparable damage. The review process can sometimes make or break a small distributor! Candidly, some of our reviewers have bristled at the idea of their review being reviewed. But, while this eventuality may cause a bit of inhibition, we feel that it encourages reviewers to do their homework when they know that someone may saw off the limb they've ventured out on.

Respondents to our "Reviewing Reviews" section have taken our reviewers to task for being both "too easy" and "too hard" on a given product. This suggests we may have achieved a delicate balance or, at least, that we can err in either direction.

This brings me to the sum and crux of what I want to share with our review audiences — the reviewers, the reviewees and our readers: the purpose of RAINBOW reviews is to provide information, to arm our readers with the facts they need to make their own decision on whether to buy a given product. This does not dictate that we always have lengthy reviews; I am amazed at how much a one-sentence description in the local paper's TV section guides me in what I select to view. It does mean a reviewer should impart as much information as needed, as concisely as possible.

I fully agree with Dale Puckett's comments in the second issue of *FHL Soft News*, the Frank Hogg Laboratory newsletter: "Reviews are meant to be used. . . . Writers are too fast to supply subjective opinions and too slow to give you objective data that backs up their position. . . . The real problem is that opinions aren't worth much and we have a surplus of them. . . . What we need is information."

Dale says it succinctly; substance is much more important than sytle. Hopefully, we can have both but, clearly, the prime purpose of a review is to tell the reader all one can about a product he or she may not be able to examine firsthand. We want our reviewers' opinions but, above all, we want our reviewers to tell our readers enough that they can form their own. That's when a review serves its purpose.

— Jim Reed

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by C.E. Laidlaw

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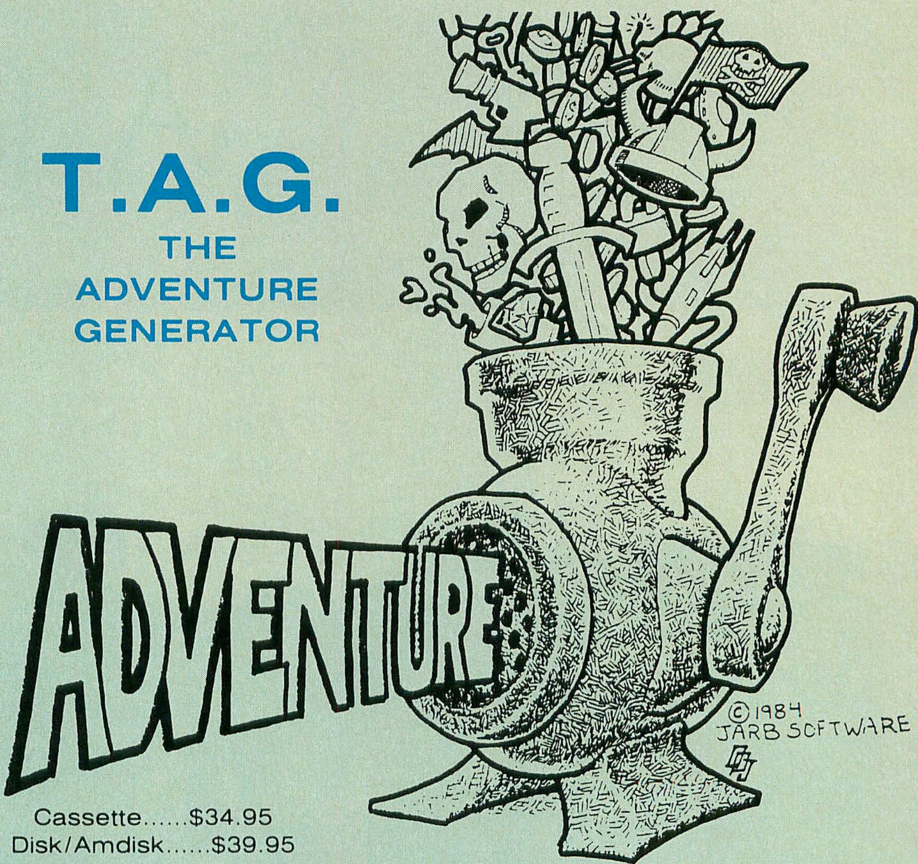

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GAME

A Journey

By Robert Rogers

Through The Jungle

The Jungle is a graphics game for the 4K, non-Extended BASIC Color Computer. It is in response to 4K owners who ask for programs for their machines. Having started with 4K, I understand the feeling of being lost in a sea . . . or jungle of 16K CoCos.

After upgrading to 32K and disk-printer system, I more or less forgot about my "old" programs. Then I came across a game I had written and enjoyed. So I spruced it up a bit (remembering not to use the other 29,000 bytes of memory I have). And here it is in its current state. Despite the small memory it still has quite a bit (byte?) of color, sound, graphics and action.

Upon running *The Jungle*, the title will appear. The theme song will play and then you will be given the chance to select your skill level. One is the easiest, while three is the most difficult. Next, the graphics are drawn.

The object of the game is to maneuver your man (orange, flashing cursor) through the jungle from the upper left-hand corner to the lower right. In the lower right corner is the safari camp (safe zone). In between are dozens of green trees. If too many are "walked into," you lose one man. The number of trees you are allowed to hit is determined by the skill level. On skill level one you can hit eight; two, you can hit five; three, you can hit three.

Control is through the use of the keyboard's arrow keys (see, you don't even need joysticks). Because of the use of *PEEKs* rather than *INKEY$* statements, you need not hit the key every time you want to move — just hold it down as long as you want in a particular direction. Also, you can go on diagonals, which saves time and can help you get out of some impossible situations by jumping between trees. Other obstacles include two blue lakes, yellow quicksand, purple bottomless pit, and a vertical river (blue). If you hit any of these you lose one man. The river must be crossed at "dry spots" (black) areas. Usually there are five such spots.

During each play the timer in the upper right of the screen shows how much time you have. If the timer hits zero, night falls and you can't see how to go to the camp, so you lose a man. At the completion of each screen your score is shown and you start over with a new maze of trees. Other indicators on the screen are from left to right: number of completed screens; men left; trees hit so far on *current screen*; and timer.

Your score is computed as follows: time left times remaining trees plus screen number times 1,000; plus other bonus points for your level. The score is always multiplied times the skill level. The highest score is displayed at the end of each game.

One thing which might cause the program to crash is if you glide your man into the timer/men-left area of the screen. For some reason, *POINT* statements give FC Errors if they are made to test text. This is an incentive for you not to go the wrong direction.

I hope 4K CoCo users enjoy *The Jungle*, although those with larger systems will enjoy it too.

Have fun!

(Robert Rogers, a junior at Forest Hill High School in West Palm Beach, Fla., has been a self-taught programmer for two years. His interests include performing professionally on the organ and model railroading.)

630	111
2650	252
7200	43
END	121

The listing:

```
0 'COPYRIGHT (C) 1982 BY ROBERT
 T, ROGERS
1 CLS8:PRINT@224,"***** THE JUNG
LE ADVENTURE *****";:PRINT@0," R
OBERT ROGERS PRESENTS ....
2 GOSUB4000:N=4:U=0
3 CLS:PRINT@224,"SKILL LEVEL (1-
3)";:INPUTL:IFL=2THENNT=6:AT=200
:ELSEIFL=3THENNT=3:AT=100:ELSENT
=8:AT=300
9 N=N-1:IFN=0THEN2610
10 A=AT:X=0:Y=0:R=0:GOSUB8000:GO
SUB7000
```

```
20 X=0
30 SET(X,Y,8):SET(X+1,Y,8):SET(X
,Y+1,8):SET(X+1,Y+1,8)
100 IFPEEK(341)=247 THEN Y=Y-2:I
FY<0THENY=0
110 IFPEEK(342)=247 THEN Y=Y+2:I
FY>30THENY=30
120 IFPEEK(343)=247 THEN X=X-2:I
FX<0THENX=0
130 IFPEEK(344)=247 THEN X=X+2:I
FX>62THENX=62
200 A=A-1
210 PRINT@27,A;
211 IFA<0THEN6000
300 RESET(XX,YY):RESET(XX+1,YY):
RESET(XX,YY+1):RESET(XX+1,YY+1)
650 GOTO1000
700 XX=X:YY=Y
800 GOTO30
1000 P=POINT(X,Y):PP=POINT(X,Y+1
)
1010 IF PP=1 THENGOSUB2000
1020 ON P GOSUB2000,2200,2400,26
00,700,700,2800
1030 GOTO700
2000 SOUND200,1:R=R+1:PRINT@25,R
:IF R>NT THEN 2100 ELSE RETURN
2100 CLS:PRINT@224,"YOU KNOCKED
YOURSELF OUT RUNNING INTO SO MAN
Y TREES. YOU DIED !!";
2110 FORM=1TO20:SOUNDRND(230),1:
NEXT:GOSUB9000
2120 GOTO9
2200 CLS2:PRINT@224,"***** STUCK
 IN QUICK SAND ******";
2210 FORM=1TO60:SOUNDRND(20),1:N
EXT:GOTO9
2400 CLS3:PRINT@224,"***** YOU D
ROWNED.TOO BAD! *****";
2410 FORM=1TO30:SOUNDRND(100),1:
NEXT:GOSUB9000:GOTO9
2600 U=U+1:S=S+A*INT(((R/NT)*10)
)+(U*1000):CLS2:PRINT@224,"SCORE
 SO FAR="S*L:GOSUB4000:GOTO10
2610 S=S*L:CLS2:PRINT@224,"SCORE
= "S
2620 PRINT"LEVEL="L
2630 IFS>HS THENHS=S:PRINT"NEW H
IGH SCORE!!!":SOUND200,10
2640 PRINT"HIGH SCORE TODAY="HS
2645 GOSUB4000
2650 GOSUB9000:GOTO2
2800 CLS7:PRINT@224," YOU FELL I
N THE BOTTOMLESS PIT  -HAVE A NI
CE FALL!! HA! HA! HA!";
2810 FORM=255TO1STEP-5
```

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```
2820 SOUNDM,1:NEXTM
2830 CLS0:GOSUB9000:GOTO9
4000 DATA58,4,78,4,89,8,78,4,89,
4,125,8,108,16
4010 FORM=1TO3:FORZ=1TO3:READK,K
K
4020 SOUNDK,KK:NEXTZ:IFM<3THENRE
STORE:NEXTM
4030 FORM=1TO4:READK,KK:SOUNDK,K
K:NEXTM:RESTORE:RETURN
6000 CLS0:PRINT@224,"IT IS ALREA
DY NIGHT---YOU LOST!!";
6100 FORM=1TO30:SOUND99,1:SOUND8
9,1:NEXT
6200 GOTO9
7000 FORH=4TO17
7010 FORV=10TO17
7020 SET(H,V,3)
7030 NEXTV,H
7100 FORH=44TO55
7110 FORV=8TO15
7120 SET(H,V,3)
7130 NEXTV,H
7200 FORH=30TO31
7210 FORV=0TO31
7220 SET(H,V,3)
7230 NEXTV,H
7300 FORT=1TO5
7310 V=RND(30)
7315 IF INT(V/2)<>(V/2)THENV=V-1
7320 RESET(30,V)
7325 RESET(30,V+1)
7330 RESET(31,V)
7335 RESET(31,V+1)
7340 NEXTT
7400 FORH=16TO23
7410 FORV=20TO27
7420 SET(H,V,2)
7430 NEXTV,H
7500 FORH=36TO45
7510 FORV=22TO27
7520 SET(H,V,7)
7530 NEXTV,H
7600 FORH=56TO63
7610 FORV=30TO31
7620 SET(H,V,4)
7630 NEXTV,H
7900 RETURN
8000 CLS0
8010 FORT=1TO170
8030 C=RND(2)
8040 IFC=1THENC=137ELSEC=134
8050 PRINT@(RND(509)),CHR$(C);
8060 NEXT:PRINT@15,U;"MEN="N:RET
URN
9000 FORM=1TO2000:NEXT:RETURN
```

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★ FREE ★ CATALOG

This is the second installment in a six-part series on creating a disk mailing list program.

Theory And Structure Of Direct Access Files — Part II

By Bill Nolan
Rainbow Contributing Editor

Last month we introduced this series with an article about the *INSTR* function and its use on the Color Computer. This month we will talk about the theory and structure of direct access files, and in the upcoming months we will learn about and develop a working database manager program. The particular program we will develop is a mailing list program.

When we are talking about disk files of data, we need to have some terms in common. A database is a group of related pieces of information arranged in some way. A database manager is a program designed to create, sort, search, or otherwise manipulate a database. To sort means to arrange in some order, such as alphabetically, or by ZIP code. To search means to look through the whole file and find all the data related in some way you have chosen. For example, you might search through a mailing list to find all of the people who live in Ohio.

Some additional terms we will be using are field, record, and file. A good way to illustrate these is by considering a mailing list program. This program will store information about several people. We may choose to keep track of the name, address, city, state, ZIP, and phone: six pieces of information about each person. Each one of these pieces of information is called a field. The name is a field, the address is another field, and so on. All of the information about one person is called a record, and all of the information about all of the people is called the file. Thus, we have files which are made up of records, while the records are made up of fields.

Whenever you are working with direct access files on any computer, including the Color Computer, all of the records must be the same length. That is, each record *must* have exactly the same number of characters as every other record in the file. The reason for this is that we may want to remove a record from the file and put another in its place, and if they aren't exactly the same size, the new record won't fit in the spot the computer has allocated for it.

For the same reason, you must decide ahead of time how long each field in the record will be, and that is then a fixed figure. For instance, considering the mailing list again, we might decide ahead of time to allow 30 characters for the name, 30 for the address, 15 for the city, two for the state code, nine for the ZIP code, and 13 for the phone number. This will make each and every record 99 characters in length, and even if we don't use all of those 30 spaces for the name, the record will still be 99 characters long. As you can see, it is important to decide on the length of each field very carefully.

Since names and addresses differ in length, the CoCo has a special command that will make everything fit. This command is *SET*, and it can be used in two forms, *LSET* and *RSET*. If you use *LSET*, the computer adds spaces to the beginning of your name to make it 30 characters long, while if you use *RSET*, the computer achieves equality of length by adding spaces to the end. If the name is too long, the computer just chops it off at the predetermined length. If it won't fit, don't worry, we'll make it fit.

If you allocate too much space for one of your fields, then a lot of space will be wasted on the disk, while too little space allocated will result in loss of data as the computer chops off the extra. Be sure to put a lot of thought into this when you choose your field length. In general, you must have enough space to accommodate the longest possible item, but no more. Let's consider names again. Many people have short names like Bill, John, Mary, Jill, and Bob, but the publisher of this magazine has the first name of Lawrence, and some other long first names are Archibald, Georgette, and Theodore. First names can easily be nine or 10 letters long.

Last names are also quite variable, ranging from Ho to Schlotzhauer, with a few even longer. Fifteen letters is not too many to allow for the last name. In addition to the first and last name, we have to allow for the space between the two names and also for something following the name, such

---

(Bill Nolan, who teaches "Programming In BASIC" at the college level, owns Prickly-Pear Software Co. and has written several commercially successful software packages.)

as Jr. or M.D. As you can see, 30 characters is just about right for the name. You will find the other figures I mentioned above are not too far off, either, so we will want to allocate 99 spaces for each record in our mailing list.

What we are doing right now is the sort of planning ahead you should do before you start to write any program. You first need to decide what the program will do for you. In this case, we decided that we wanted a program that would keep a mailing list on disk, sort that list, and search it for us.

We have also decided that we are going to keep track of six pieces of information about each person, and we have decided how much space to allocate for each piece of information. The next thing to be decided is what main sections we will need in our program in order to fulfill our objectives.

> ***"The final mailing list will be a pretty nice one, with the ability to search or sort on any field, and a fairly fast sort method utilizing a temporary directory."***

Most programs need a section in the beginning to set things up. This is where we can clear space for strings, set up any initial variables, and print out the main menu of the program. Our main menu will have choices on it for such things as Add Names, Search, Sort, Print List, and Print Labels. We will need a section for each of these things.

Let's start by considering some of the commands we will need to use for the disk access portion of our program.

```
10 OPEN "D", #1 "MAILLIST/DAT", 99
```

This line does several things for our program. First, the command *OPEN* creates a channel of communication between the computer and the disk drive. The *"D"* tells the computer that we will be using the direct access mode of storage. The #1 tells the computer to use buffer #1 for temporary storage of the information passing back and forth between the computer and disk drive. *"MAILLIST/DAT"* is the name of our file, and the 99 is the length of each record in the file. When this command is executed, the computer will look on the disk in the drive to see if there is already a file named *"MAILLIST"* out there, and if there isn't, the computer will create one. Try running that line, and you will see that the disk directory gets a new entry. By the way, when working with disk files it is a good idea to type the command *UNLOAD* before removing a disk from the drive. This will close all open channels, and help prevent data loss.

```
20 FIELD #1, 30 AS N$, 30 AS A$, 15 AS C$, 2 AS S$, 9
   AS Z$, 13 AS P$
```

This line tells the computer how we are going to divide up the 99 spaces into fields, and which variable names will be used to refer to which fields.

```
25 FOR R=1 TO 3
```

The *FOR* loop set up here will let us type in the information about three people and store it on the disk.

```
30 INPUT"NAME";X$:LSET N$=X$
40 INPUT"ADDRESS";X$:LSET A$=X$
50 INPUT"CITY";X$:LSET C$=X$
60 INPUT"STATE";X$:LSET S$=X$
70 INPUT"ZIP CODE";X$:LSET Z$=X$
80 INPUT"PHONE #";X$:LSET P$=X$
```

These six lines let us input the information about a person, and then "make it fit" our pre-decided field lengths by applying the *LSET* command.

```
90 PUT #1,R
```

This line puts the information on the disk. The #1 is the buffer number, and is the same as the *#1* in Line 10. The *R* is the record number. Every record in a direct access file is numbered, and the file is called a direct access file because we can go directly to the information we want if we know its number. The number is like the address of that record.

```
95 NEXT R
```

Line 95 sends us back to Line 25 so we can input the information for the next person. This loop will continue until we have input the information about all three people.

```
97 CLS
100 FOR R = 1 TO 3
```

Now we've re-established the loop because we are going to go out on the disk, get the information about the five people, and print it on the screen.

```
110 GET #1, R
```

The *GET* command is the opposite of *PUT*. *PUT* writes the information on the disk as the record number specified, while *GET* retrieves the information.

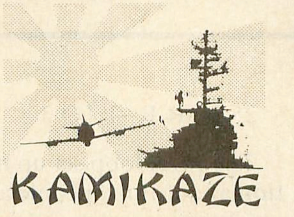
```
120 PRINT N$:PRINT A$:PRINT C$,S$,Z$,P$:PRINT
130 NEXT R
```

Line 120 prints out the information about one of the people in the file, and 130 completes the loop. All we have to do now is tell the computer we are finished with this file for the present. The command to do that is:

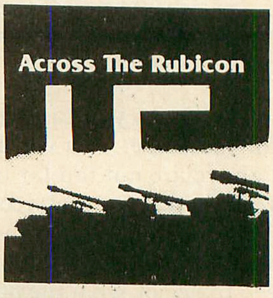
```
140 CLOSE #1
```

This tells the computer that we are finished communicating with the disk drive through buffer #1.

In the next four columns we will write each of the sections we talked about above almost as though they were separate programs, and then combine them together into our mailing list. The final mailing list will be a pretty nice one, with the ability to search or sort on any field, and a fairly fast sort method utilizing a temporary directory. Our program will be designed to handle about 400 names. Between now and next month, you start getting your names together, and I'll finish writing the mail list program. See you next month with part three.



BOMBER COMMAND



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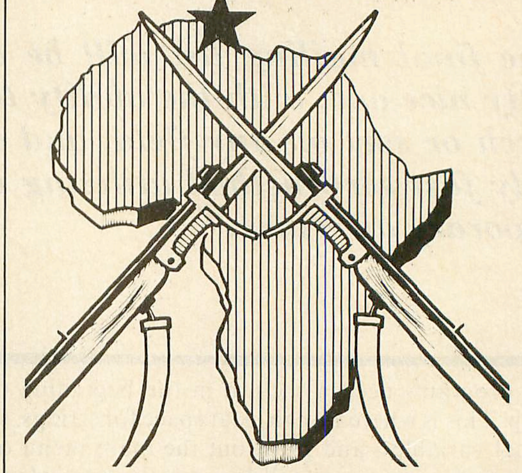

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By Charles Husak

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(Charles Husak, who holds a bachelor of science degree in education, is a computer technician and the author of The Little Runner.*)*

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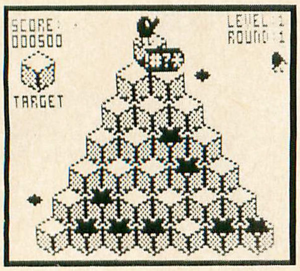

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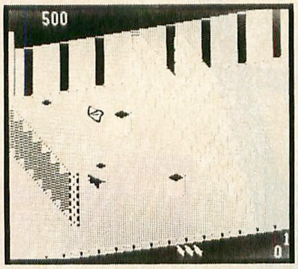

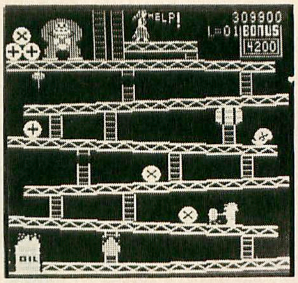

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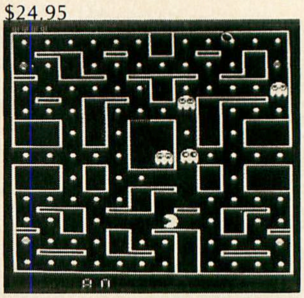

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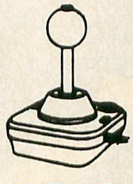

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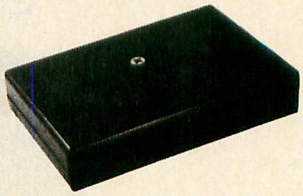

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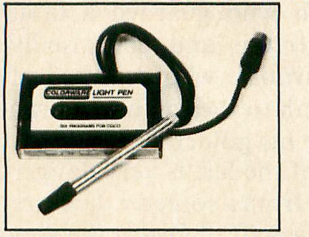

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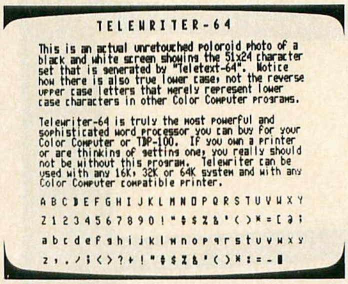

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TELEWRITER-64

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z , . / ; < > ? + ! " # $ % & ' ( ) * : = - █
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The Dragon's Gold, requiring 32K ECB, is a game of arcade action which I wrote for my eight-year-old daughter, Dianne. For those who can use the higher computer speed, enter *5 POKE 65495,0*. Speeding up the computer will also increase the difficulty. To start the game after the title either push the Space Bar or the joystick button. And here's a hint before you begin the quest: Keep moving because if you stop, the Hornbobers will speed up.

100	41	2756	51
195	94	3030	122
430	52	3155	1
2100	123	3240	57
2302	81	END	215

The listing:

```
6 DIM R(10),S(10)
7 TR=1
8 CLS:GOSUB3000:CLS
9 CLS:GOTO2000
10 T=&H1A:Z=1:POKE&H415A,0
11 C=183:D=162:P=0
12 POKE&H4123,&H59:POKE&H4125,&H
46:POKE&H4127,&H59
13 KL=0:POKE&H3F58,&H1A
15 PMODE4:SCREEN1,1:PMODE3
20 PCLS
30 DRAW"BM0,184;C7;R255"
40 PAINT(8,188),7,7
50 DRAW"BM0,144;C7;R255"
55 DRAW"BM0,152;C7;R208U8R18D8R3
0"
57 PAINT(250,148),7,7
60 PAINT(8,148),7,7
70 DRAW"BM0,112;C7;R33U8R18D8R21
0"
75 DRAW"BM0,104;C7;R255"
77 PAINT(250,108),7,7
80 PAINT(8,108),7,7
90 DRAW"BM0,72;C7;R208U8R18D8R30
"
95 DRAW"BM0,64;C7;R255
97 PAINT(250,68),7,7
100 PAINT(8,68),7,7
110 DRAW"BM0,44;C7;R24U4R20D8R4D
4R4D4R4D4R4D4"
120 PAINT(20,48),7,7
125 GOSUB130
126 GOTO160
130 DRAW"BM212,184;C7;U4R8D4U8L8
D4U8R8D4U8L8D4U8R8D4U8L8D4U8R8D4
U8L8D4U8R8D4"
140 DRAW"BM36,144;C7;U4R8D4U8L8D
4U8R8D4U8L8D4U8R8D4U8L8D4U8R8D4U
8L8D4U8R8D4"
150 DRAW"BM212,104;C7;U4R8D4U8L8
D4U8R8D4U8L8D4U8R8D4U8L8D4U8R8D4
```

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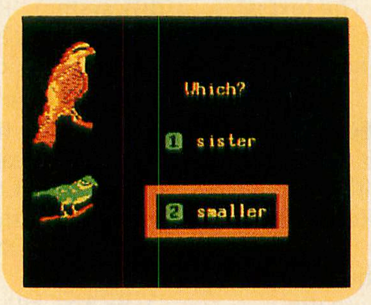
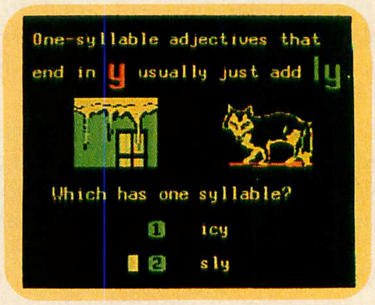

Which?
1 sister
2 smaller


One-syllable adjectives that end in y usually just add ly.
Which has one syllable?
1 icy
2 sly

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```
U8L8D4U8R8D4"
155 RETURN
160 DRAW"BM8,44;C6;U4H4G2;BM10,4
~~4;U6E6U2;BM8,40~~;U3H6U2;BM10,40;U
10E3"
165 DRAW"~~BM18,30;C8;~~D6R2U6L2"
170 DRAW"~~BM70,63;C6;~~U2R6U2R6U2R6
U2R6U2R6D2R5D2R6U2R4U2R4D2R2E8R3
D2L1D2L2D2L2D2L2D2R10"
173 DRAW"BM240,63;C8;U15L3E5F5L4
D15"
180 DRAW"BM70,63;C6;R15U3F3R4U4F
4R20U2L4U2R22U2"
185 PAINT(72,62),6,6:PAINT(89,60
),6,6
187 PSET(118,55,7)
188 POKE&H3F58,&H1A:POKE&H3F59,&
H40
189 EXEC&H3F00:Y=65
190 POKE&H3F07,&H3F:POKE&H3F08,&
H5B
192 EXEC&H4099
195 A=JOYSTK(0)
200 IF A>50 THEN GOSUB2300
210 IF A<10 THEN GOSUB2330
215 B=JOYSTK(1)
220 IF B<10 AND PEEK(&H3F59)=&H5
A THEN GOSUB2650
230 IF B<10 AND PEEK(&H3F59)=&H4
4 AND C=143THEN GOSUB 2660
240 Z=Z+1
250 IF Z=8 THEN GOSUB405
260 IF Z=20 THEN GOSUB 430
265 IF PEEK(&H3F59)>77 AND PEEK(
&H3F59)<82 THEN 266 ELSE 270
266 IF Z>8 AND Z<20 THEN GOSUB47
0
270 IF PEEK(339)=254 THEN GOSUB1
000
272 EXEC&H4099
275 EXEC&H3F00
278 EXEC&H4130
279 IF PEEK(&H415A)=100 THEN 480
280 IF PEEK(&H3F58)=&H0B THEN 27
80
310 SC=SC+10
400 GOTO190
405 DRAW"BM120,112;C1;U8R20D8L20
":PAINT(125,108),1,1
410 DRAW"BM120,152;C1;U8R20D8L20
":PAINT(125,149),1,1
420 RETURN
430 DRAW"BM120,112;C7;U8R20D8L20
":PAINT(125,108),7,7
440 DRAW"BM120,152;C7;U8R20D8L20
":PAINT(125,149),7,7
450 Z=0
460 RETURN
470 IF PEEK(&H3F58)<15 THEN RETU
RN
475 IF PEEK(&H3F58)>25 THEN RETU
RN
480 SR=SR+1
481 PLAY"L20;O4;1;2;3;4;5;6;7;8;
9;10;11;12"
483 IF SR>2 THEN 490
484 GOTO10
490 TR=4
491 PLAY"L20;O4;1;2;3;4;5;6;7;8;
9;10;9;8;7;6;5;4;3;2;1"
495 GOTO9
1000 A=PEEK(&H3F58)
1005 EXEC&H3F3C
1010 A=A-1
1020 POKE&H3F58,A
1030 EXEC&H3F1E
1033 FORX=1TO4:EXEC&H4099
1034 PLAY"O3L30;4;5":NEXTX
1035 EXEC&H3F3C
1040 A=A+1
1050 POKE&H3F58,A
1055 EXEC&H3F00
```

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★ COLOR COMPUTER DICTIONARY ★

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```
1060 RETURN
2000 SR=0
2080 FORV=1TO8:GOSUB2200:NEXT:FO
RV=1TO8:GOSUB2200:NEXT
2090 FORV=1TO8:GOSUB2210:NEXT:FO
RV=1TO6:GOSUB2210:NEXT
2100 FORV=1TO8:GOSUB2220:NEXT:FO
RV=1TO7:GOSUB2220:NEXT
2105 POKE1534,143:POKE1535,143
2110 DEFUSR0=16515
2120 PRINT@136,"THE DRAGON'S GOL
D";:PRINT@207,"BY";
2130 PRINT@233,"CHARLES A HUSAK"
;
2140 IF TR=4 THEN PRINT @ 393,"S
ORRY YOU LOSE ";
2145 IF TR=5 THEN PRINT @ 389,"Y
OU HAVE WON THE GOLD";
2170 SCREEN0,1
2172 W=1
2175 R$="CFCFCFCFGFEFGCECECECECEFE
DEFCEFEDEFCAF"
2176 N$="T6O2L5"
2180 A=USR0(0):IFW=36 THEN W=1
2181 M$=MID$(R$,W,1):W=W+1
2182 PLAY"XN$;XM$;"
2183 A=USR0(0)
2185 IF INKEY$=" " OR PEEK(339)=
254THEN10 ELSE2180
2200 PRINTSTRING$(2,127+16*V);:R
ETURN
2210 PRINTSTRING$(2,127+16*(9-V)
)TAB(30)STRING$(2,127+16*V);:RET
URN
2220 PRINTSTRING$(2,127+16*(9-V)
);:RETURN
2300 POKE&H3F26,&H87:POKE&H3F08,
&H5B
2302 EXEC&H3F3C:EXEC&H3F00
2304 FORX=1TO30:NEXT
2305 EXEC&H3F3C
2306 EXEC&H3F1E
2307 GOSUB130:EXEC&H4130:IF PEEK
(&H415A)=100 THEN 480
2308 EXEC&H3F3C
2310 IF PEEK(&H3F59)=&H5C THEN19
0
2312 POKE&H3F59,Y
2314 Y=Y+1
2315 EXEC&H3F00
2316 RETURN
2330 POKE&H3F26,&HEF:POKE&H3F08,
&HC3
2500 EXEC&H3F3C:EXEC&H3F00
2510 FORX=1TO30:NEXT
2515 EXEC&H3F3C
2520 POKE&H3F59,Y
2530 EXEC&H3F1E
2535 EXEC&H4130:IF PEEK(&H415A)=
100 THEN 480
2540 GOSUB130
2550 EXEC&H3F3C
2555 IF PEEK(&H3F59)=&H40 THEN19
0
2595 Y=Y-1
2598 EXEC&H3F00
2600 RETURN
2650 C1=210:D1=225
2655 GOTO2700
2660 C1=35:D1=48
2700 IF C1=210 AND P=10 THEN RET
URN
2702 IF C1=210 AND P=30 THEN RET
URN
2705 POKE&H3F07,&H40:POKE&H3F08,
&H2B
2710 EXEC&H3F00
2715 GET(C1,C)-(D1,D),R,G
2730 POKE&H3F08,&H57
2740 EXEC&H3F00
2745 GET(C1,C)-(D1,D),S,G
2751 PUT(C1,C)-(D1,D),R,PSET
2752 GOSUB130:C=C-2:D=D-2:EXEC&H
4099
2753 LINE(C1,C+2)-(D1-2,D+2),PRE
SET,BF
2754 PUT(C1,C)-(D1,D),S,PSET
2755 FORX=1TO40:NEXT:C=C-2:D=D-2
2756 LINE(C1,C+2)-(D1,D+2),PRESE
T,BF
2757 DRAW"BM30,104;R22"
2758 DRAW"BM206,64;R22"
2759 DRAW"BM206,144;R22"
2760 P=P+1:IF P=10 THEN 2765
2762 IF P=20 THEN 2765
2763 IF P=30 THEN 2765
2764 GOTO2751
2765 POKE&H3F07,&H3F:POKE&H3F08,
&H5B
2767 T=T-5
2768 POKE&H3F58,T
2770 RETURN
2780 XX=220
2782 IF KL=9 THEN 2900
2783 EXEC&H4099
2784 A=JOYSTK(0):KL=KL+1
2785 IF A>50 THEN GOSUB2300
2786 IF A<10 THEN GOSUB2330
2787 IF PEEK(&H3F59)>&H5A THEN G
OSUB 2850
2788 IF PEEK(&H3F59)<82 AND KL<1
6 THEN GOSUB480
2790 IF PEEK(&H3F59)=&H48 THEN 2
930
```

GRAPHICOM

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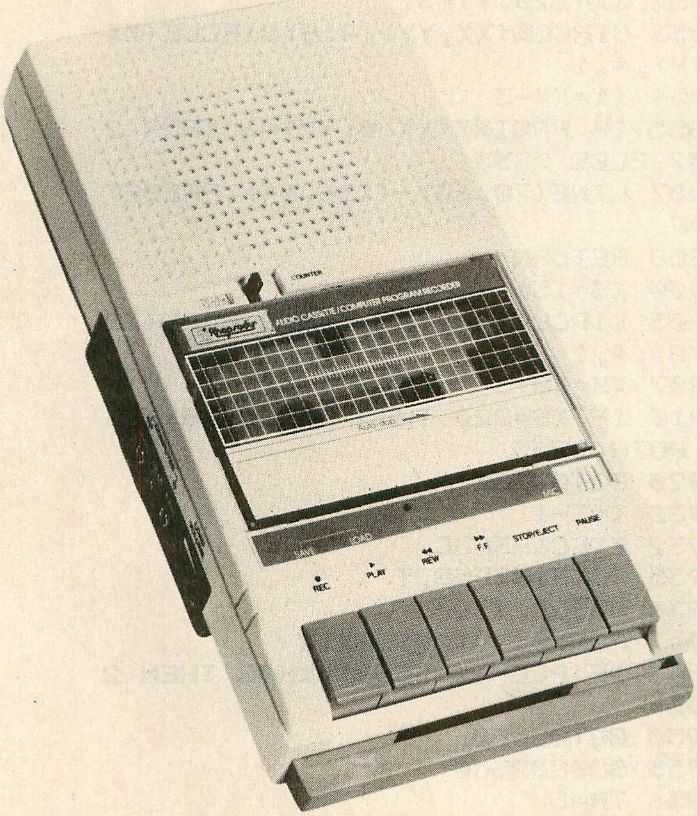

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```
2840 IF XX<200 THEN 2783
2845 GOTO 2782
2850 IF PEEK(339)=254 THEN 2852
ELSE RETURN
2852 XX=220:YY=57
2853 CIRCLE(XX,YY),4,8:CIRCLE(XX
,YY),4,1
2854 XX=XX-3
2855 IF PPOINT(XX-4,YY)=6 THEN 2
857 ELSE 2853
2857 LINE(70,63)-(136,44),PRESET
,BF
2858 RETURN
2900 XS=136:YS=57
2905 CIRCLE(XS,YS),4,6:CIRCLE(XS
,YS),4,1
2907 XS=XS+3
2910 IF XS=220 THEN GOSUB480 ELS
E GOTO 2905
2920 GOTO2780
2930 T=T-1
2932 EXEC&H3F3C
2935 POKE&H3F58,T
2936 GOSUB2330
2947 FORX=1TO100:NEXTX
2948 IF PEEK(&H3F58)=&H08 THEN 2
955
2950 GOTO2930
2955 GOSUB2330
2956 TR=5
2957 FORE=1TO1000:NEXTE
2960 GOTO9
3000 PRINT @232,"ONE MOMENT PLEA
SE"
3001 FOR A=16128 TO 16730
3005 READ D$
3010 V=VAL("&H"+D$)
3015 POKE A,V
3020 NEXT
3025 RETURN
3030 DATA 86,16,B7,3F,56,10,8E,3
F
3035 DATA 5B,BE,3F,58,C6,02,A6,A
0
3040 DATA A7,80,5A,26,F9,30,88,1
E
3045 DATA 7A,3F,56,26,EF,39,86,1
4
3050 DATA B7,3F,5A,10,8E,3F,87,B
E
3055 DATA 3F,58,C6,03,A6,A0,A7,8
0
3060 DATA 5A,26,F9,30,88,1D,7A,3
F
3065 DATA 5A,26,EF,39,86,16,B7,3
F
3070 DATA 57,BE,3F,58,86,00,C6,0
3
3075 DATA A7,80,5A,26,FB,30,88,1
D
3080 DATA 7A,3F,57,26,F1,39,FF,0
0
3085 DATA 1A,5E,FF,0A,80,0A,80,2
A
3090 DATA A8,0F,C0,2B,70,2B,FC,A
B
3095 DATA FC,AB,C0,0F,F0,0F,F0,3
E
3100 DATA 80,3E,80,3E,80,3E,A0,3
F
3105 DATA 88,3F,08,0F,08,0A,A0,0
A
3110 DATA 80,0A,80,0F,F0,0F,FC,0
0
3115 DATA A8,00,00,A8,00,02,AA,8
0
3120 DATA 00,FC,00,02,B7,00,02,B
F
3125 DATA C0,0A,BF,C0,0A,BC,00,0
0
3130 DATA FF,00,00,FF,00,3F,AF,0
C
3135 DATA 3F,AF,FC,00,AF,FC,00,A
A
3140 DATA 00,00,AA,0C,0E,AA,8C,0
E
3145 DATA AA,AC,0E,A0,AC,0C,00,A
C
3150 DATA 0C,00,00,02,A0,02,A0,2
A
3155 DATA A8,03,F0,0D,E8,3F,E8,3
F
3160 DATA EA,03,EA,0F,F0,0F,F0,0
2
3165 DATA BC,02,BC,02,BC,0A,BC,2
2
3170 DATA FC,20,FC,20,F0,0A,A0,0
2
3175 DATA A0,02,A0,0F,F0,3F,F0,0
0
3180 DATA 2A,00,00,2A,00,02,AA,8
0
3185 DATA 00,3F,00,00,DE,80,03,F
E
3190 DATA 80,03,FE,A0,00,3E,A0,0
0
3195 DATA FF,00,00,FF,00,30,FA,F
C
3200 DATA 3F,FA,FC,3F,FA,00,00,A
A
3205 DATA 00,30,AA,00,32,AA,B0,3
A
3210 DATA AA,B0,3A,0A,B0,3A,00,3
0
```

```
3215 DATA 00,00,30,02,A0,02,A0,0
A
3220 DATA A8,03,F0,02,A0,02,A0,3
A
3225 DATA A8,3A,A8,33,F0,3F,BC,3
F
3230 DATA BC,02,AC,02,AC,02,AC,0
2
3235 DATA A0,02,A0,02,A0,03,20,0
F
3240 DATA 20,00,20,00,30,00,3C,0
2
3245 DATA A0,02,A0,0A,A8,03,F0,0
2
3250 DATA A0,02,A0,0A,AB,0A,AB,0
3
3255 DATA F3,0F,BF,0F,BF,0E,A0,0
E
3260 DATA A0,0E,A0,02,A0,02,A0,0
2
3265 DATA A0,02,30,02,3C,02,00,0
3
3270 DATA 00,0F,00
3280 DATA 8E,03,FF,30,01,A6,84,2
C,04
3290 DATA 8B,10,8A,80,A7,80,8C
3300 DATA 06,01,2F,F1,39
3310 DATA 12,BE,41,22,30,01,BF,4
1,28,8D,56,BE,41,24,30,1F,BF,41
3320 DATA 28,8D,4C,BE,41,26,30,0
1,BF,41,28,8D,42,BE,41,22,8C,12
3330 DATA 41,27,4D,8D,1A,30,1F,B
F,41,22,BE,41,24,8D,10,30,01,BF
3340 DATA 41,24,BE,41,26,8D,06,3
0,1F,BF,41,26,39,10,8E,41,2A,BF
3350 DATA 41,28,C6,06,A6,A0,A7,8
0,30,88,1F,5A,26,F6,A6,9F,41,22
3360 DATA B7,41,21,BE,41,28,39,B
E,41,28,86,0,C6,06,A7,80,30,88
3370 DATA 1F,5A,26,F8,BE,41,28,3
9,8E,12,59,BF,41,22,8E,17,46,BF
3380 DATA 41,24,8E,1C,59,BF,41,2
6,7E,40,99,0,12,59,17,46,1C,59
3390 DATA 12,5D,41,41,14,14,55,5
5
3400 DATA BE,41,22,30,01,8D,0F,B
E,41,24,30,1F,8D,08,BE,41,26
3410 DATA 30,01,8D,01,39,A6,84,8
1,41,26,07,39,86,64,B7,41,5A
3420 DATA 39,A6,84,81,00,26,F4,3
9,0
```

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RAINBOW WISHING WELL

16K ECB

Computer rules to live by, programming, and educational shortcuts in . . .

Getting Ready For The Fall

By Fred B. Scerbo
Rainbow Contributing Editor

Editor's Note: If you have an idea for our "Wishing Well," send it directly to Fred or c/o THE RAINBOW. *We don't promise that any given wish will be granted, but you may be lucky if a certain program looks like a challenge or is educational. All programs developed from your ideas are for your use, but remain the property of the author.*

Here we are in the middle of summer vacation and what does the "Wishing Well" have in store for you? What else, but a set of programs which will help you when you go back to school in the fall.

Actually, spending the summer months in preparation for school is not that unusual. Quite often the summer is the only time teachers have to actually try any type of curriculum development. (There is a reason for this. Can you imagine trying to map out your navigational route halfway through a journey? It is the same with teaching. Advance planning is essential.) Since a large number of responses and phone calls have been from educators and parents who want to help their children with their Color Computers, I decided to dip into the "Wishing Well" to come up with two programs which I have used quite often in my classroom during the last three years. (These programs are not three years old, but have evolved. In fact, I must have had at least two dozen variations on these programs. What you will see here are the most current refinements.)

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

Over the most recent articles, some of you may have been able to discern what my philosophy of computers is. (A philosophy of computers?) To sum it up in just a few words, the Scerbo Rules of Computer Use go something like this:

1) Never do by hand what can be done more easily by computer.
2) Never do by computer what can be done more easily by hand.

Sound logical? Sound like something that nearly every computer user would take for granted?

You would be amazed to discover that many computer users do not readily subscribe to this philosophy. (Note that I said users and not programmers.) Quite often when a person gets a new computer, he or she will want to do nearly every simple task imaginable with the computer. One request which I receive at least twice a week is for a program to pick random numbers for our state lottery, "The Megabucks." Sure, writing a program like this is simple, but I have yet to hear of anyone writing one which regularly picked the winning numbers. (Don't you think that if I could write such a program I would have written it months ago and stopped writing columns and teaching?)

On other occasions, people have asked me to help develop filing programs to keep track of names and phone numbers of clients in small businesses. My argument is always the same. Why do this with a computer when the same task can be done much more easily with a simple set of file cards? Who really wants to waste time loading files if a file card can be more quickly looked up? Such computer efforts are often a waste of time. If a computer is needed for this type of work and we are talking about massive numbers of clients, then we can talk about getting a database program which will let us sort by a number of different factors. (Example: Give me the names of all clients in a given town who are left-handed, etc.) Since there are a number of programs on the market that can do these tasks, why bother to re-invent the wheel? This brings us to the third Scerbo rule:

> 3) Never rewrite a program that already exists unless you can make it better and the improvements warrant the extra time invested.

Some of the programs which I have listed in the first few "Wishing Wells" have been exactly that, such as the *Screen Quiz* programs, which were inspired by other programs. Improvements were made in those programs which made the programs much more flexible for those wanting to use them, thus justifying the time spent.

The first two rules which I discussed have actually come to play recently as well as in the development of the two programs you see listed here. I'll get to those recent developments by the end of the article, but for now, let us get down to the business at hand: the two programs listed here.

Remember my first rule: Never do by hand what can be done better by computer. Well, this rule can be especially well suited in the teaching of math. Some of my students come to my resource room for math remediation. Since some of them may be operating on a third or fourth grade math level, I often use my Color Computers for addition and subtraction remediation. However, not all of my students respond well to just sitting at a computer. No matter how much time a student spends learning from a computer, the actual skills still have to be applied to paper.

In most cases, this is simple. There are countless math workbooks available which have the problems a student needs to master in order to improve his or her math skills. There is one catch, however. Most commercially available books will only spend a single chapter on a given skill. Add to that a page or two with examples and then it's on to the next chapter. Nearly all these books assume that the skill will be mastered in a single chapter.

This is rarely the case when working with students who need math remediation. It might take months to master a single skill, such as borrowing in subtraction.

What is a parent or teacher to do in such cases? They do what teachers have done for decades: they create math worksheets and problem papers by hand. Believe me, this can be very time consuming. Just try to sit down and think up a pattern of random numbers that you haven't used before. After a short period of time, this task becomes complicated if not tiring when done manually.

If you had to name the one thing that a computer does easily, what would you say it was? The answer would most likely be — select random numbers, right? Therefore, if we want to use this function to help create our own math sheets, the task should be relatively simple.

(We do have one caution to consider, however. All computers do not generate true random numbers. Instead, they generate a sequence of numbers which appear to be random. Therefore, to avoid a repeat of the same sequences, we can solve this problem by making a random number equal to the value of *-TIMER*, a negative *TIMER* value. Since we can never predict that value of the *TIMER* at any given point, the effect will be to reset our random number generator.)

Both programs listed will generate these worksheets. The first is called *Super Math Worksheet Generator* and will generate, on an 8½ by 11-inch sheet of plain or tractor feed paper, a problem sheet of 18 math problems equally spaced on the page. The program naturally requires a line printer. One that works with a Color Computer should be suitable unless you are using the color pen plotter or thermal printer. (The results with these would tend to be too small to be of any use.) The page prints out the problems in the enlarged print *CHR$(31)* mode. The largest digit any problem will contain will be four digits wide.

> **"Super Math Worksheet Generator *. . . is the one program which I have used every day of teaching for over the last two years."***

The first rule also comes to play in the special feature of the program: it creates a coded answer sheet. When I first started creating these random sheets, there was no answer sheet. Instead, I would often spend time correcting my students' papers either by hand or with a pocket calculator. This was once again a foolish waste of time since the computer had the ability to create the answers as well as the problems. The special feature of the answer section is also contained in the fact that it gives each set a random sheet identification number which can be matched with the answer sheet.

This feature can be used in several ways. Sometimes I will print the answers at the bottom of the sheet and fold the bottom of the paper so that they are not visible to the student. The bottom can even be torn off. In other cases where the student might not be so trustworthy, I would let the program save the answer sheets for up to six different problem sheets. These can then be printed up on a separate sheet of paper which is held until you choose to print them, or until you have made a total of six worksheets. The program will hold the answers and the corresponding identification numbers so they can be matched up later.

On running the program, you will be presented with a menu which includes addition, subtraction, multiplication, division and the exit program. When you select subtraction, the program will ask for a maximum digit up to 999. This will in fact create a four digit problem when a three digit number is entered, insuring that the minuend is always larger than the subtrahend. If we select addition or multiplication, we can enter up to 9999 as our maximum number. Any larger number will not be accepted and pressing ENTER with no number will return us to the menu. When we use division, we will be asked to select a number between 99 and 999. This will generate division problems from a low of two or three digits to a maximum of four digits. Playing around with these input numbers will help you to select the type of problems you wish to generate.

How successful or valuable is *Super Math Worksheet Generator*? Let me give you a hint. It is the one program which I have used every day of teaching for over the last two years. I begin every day by creating the worksheets that I need for my students. I am never at a shortage of math materials since I can always load in *MATHGEN* (its disk filename) and create what I need at the learning level I need. Try it and let me know what your comments are on it.

Now let's take a look at Listing 2 which is titled *Written Math Problem Generator*. This program is very different from *MATHGEN* in that it creates verbal problems along the lines of "If Johnny has three dollars and wants to

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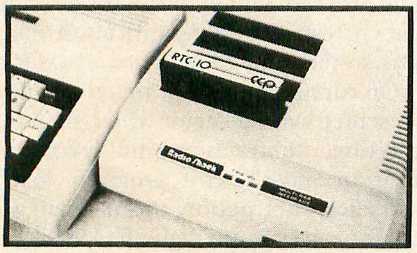

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buy . . ." etc. The program is designed to write 12 problems on two sheets of paper. It is designed so that the computer prints the first six problems and then waits for a prompt while you prepare the second sheet, or, if you choose, to reverse the paper so as to print on the reverse side of the same sheet. Printing on the reverse side can be a wise idea if you are using a line printer which accepts single sheets. It can help save paper, which is in increasingly short supply in many school systems.

If you check the *DATA* statements, you will notice many names listed. I have included these names to be used, at random, for the creation of these written problems. You may wish to substitute the names of your own children or students so that they will enjoy working with the worksheets that much more. (Just keep most names around eight or nine letters long.) You will also find the names of products (tapes, food, etc.) which you may wish to alter. Just be sure you change the number of data items or you will get an OD Error.

MATHPROB, as it is called, will create an answer sheet, but will not store successive sheets like *MATHGEN* will. You may wish to print the sheet at the bottom of the second side, or put it on another sheet. The choice is yours.

Both programs should be immense time savers for you and should prove valuable if you do teach. I have mentioned that some of my educational programs have been translated to Apple or Pet BASIC. These programs would be very difficult to translate into APPLESOFT because there is no *PRINTUSING* command in APPLESOFT. The next time one of your friends tries to tell you that the Apple IIe is a better computer, ask that person if the Apple can print numbers with decimals for dollars and cents. The answer will be no. You would have to write an algorithm to work around this deficiency. Good luck if you want to try! Just thank your CoCo that you don't have to do the same as the Apple owners.

Once again, I want to thank you for your suggestions and wishes. I hope these two programs have granted some of your wishes. Keep those ideas coming.

I did mention earlier that there was one more development which had to do with my rule about using the computer to save time with things you would normally have to do by hand. If you remember my articles from recent months, I have mentioned that the members of my high school wrestling team were wondering when I would write a sports program that had to do with wrestling.

Well, the task was finally completed, but not in the way that I originally had intended. The normal high school wrestling season ends in late February. However, during the spring and summer months, many high school wrestlers participate in freestyle wrestling sponsored by the USA Wrestling Federation or under AAU tournaments. Since the start of the freestyle season, I have gone to a tournament with our wrestlers nearly every week. At these tournaments, fellow coach Brian Collins and I have helped with the pairings and bout sheets which have to be completed before any wrestling starts (usually an hour and a half before!).

After trying this time consuming process by hand, it didn't take long for me to realize that the computer could do the same task more easily. As a result, my program for pairing and bout sheets was used recently at the Northeastern Regional Kids Freestyle Tournament in Easton, Pa., as well as the New England Regional Junior Freestyle Tournament at the University of New Hampshire in Durham, N.H.

If things go as planned, by the time you read this, I may have actually had the opportunity to use this program as part of the selection of the June USA Olympic Wrestling Team in Michigan as well as the actual event this summer in Los Angeles. There are still many details to be worked out as of the time of this writing, but the thrill of just being asked to help out the USA Wrestling Federation in this big event was just too much not to share.

Therefore, in an upcoming "Wishing Well," I will try to share an off-shoot of these programs which can be used for any sport or any type of competition. Since these would be much more useful than strictly a wrestling program, I'll share the more general versions that would be of greater interest to more of you.

Just keep in mind that when you set a goal with your CoCo, great things can often come of it. With a little luck, by the time you read this I may have gotten a summer vacation in Los Angeles using my computer for a once-in-a-lifetime opportunity.

I'll keep you posted. In the meantime, keep those letters coming.

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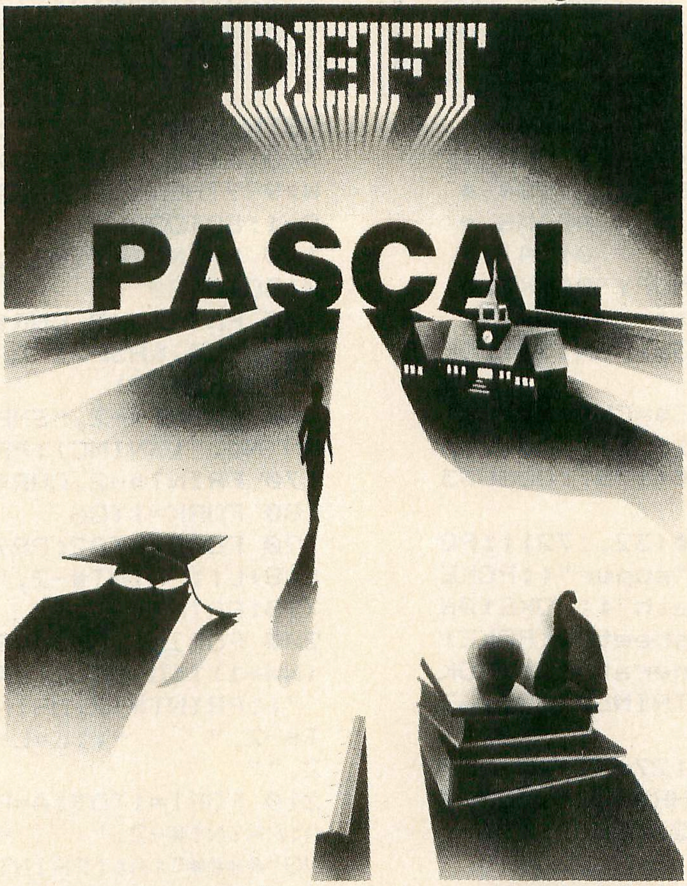

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50	115
150	187
340	215
570	1
730	202
790	123
END	167

Listing 1:

```
1 '****************************
2 '* SUPER MATH WORKSHEET GEN *
3 '* BY FRED B.SCERBO (C)1984 *
4 '* 149 BARBOUR ST.  N.ADAMS *
5 '* MASSACHUSETTS   -   01247 *
6 '* ILLUSTRATED MEMORY BANKS *
7 '****************************
10 DIM U(6,36),D(6,36),SN(30),QK
$(30)
20 CLS3:SCREEN0,1:LC$=CHR$(175)+
CHR$(170):RC$=CHR$(165)+CHR$(175
):EB$=CHR$(175)+CHR$(175):GOSUB3
0:GOTO40
30 CLS5:PRINTSTRING$(32,172);:PO
KE1056,32:PRINT@33,"super";:POKE
1062,32:PRINT@39,"math";:POKE106
7,32:PRINT@44,"worksheet";:POKE1
077,32:PRINT@54,"generator";:POK
E1087,32:PRINT@64,STRING$(32,163
);CHR$(175);:RETURN
40 FORI=0TO8:PRINT@127+(I*32),EB
$;:NEXT:PRINT@133,CHR$(175);CHR$
(174);STRING$(18,172);CHR$(173);
CHR$(175);
50 PRINT@165,LC$;" (A)DDITION
    ";RC$;:PRINT@197,LC$;" (S)UB
TRACTION    ";RC$;:PRINT@229,LC$
;" (M)ULTIPLICATION ";RC$;:PRINT
@261,LC$;" (D)IVISION       ";RC
$;:PRINT@293,LC$;" (E)XIT PROGRA
M   ";RC$;
60 PRINT@325,CHR$(175);CHR$(171)
;STRING$(18,163);CHR$(167);CHR$(
175);
70 PRINT@384,STRING$(32,172);:PO
KE1440,32:POKE1441,32:POKE1442,3
2:POKE1443,32:POKE1444,32:PRINT@
421,"press";:POKE1450,32:PRINT@4
27,"desired";:POKE1458,32:PRINT@
435,"category";:POKE1467,32:POKE
1468,32
80 POKE1469,32:POKE1470,32:POKE1
471,32:PRINT@448,STRING$(32,163)
;STRING$(31,128);:POKE1535,128:I
F NC=>6 THEN 750
90 X$=INKEY$:KE=RND(-TIMER):IFX$
="S"THENGOSUB120ELSEIFX$="A"THEN
GOSUB290ELSEIFX$="M"THENGOSUB430
ELSEIFX$="D"THENGOSUB560ELSEIFX$
="E"THEN730ELSE90
100 GOTO20
110 REM SUBTRACTION SECTION
120 NC=NC+1:GOSUB30:FORI=127TO19
1STEP32:PRINT@I,EB$;:NEXT:PRINT@
192,STRING$(32,172);
130 QK$(NC)="S":PRINT@132," SUBT
RACTION WORKSHEETS ";:PRINT@224,
"        INPUT NUMBER SPAN":PRIN
TSTRING$(32,32);:PRINT@256,"   (
3 DIGITS-MAX.999)";:INPUTWW:IF W
W>999THEN130ELSEIF WW=0THEN NC=N
C-1:GOTO20
140 SN(NC)=TIMER:L=1:W=1:GOSUB15
0:GOTO180
150 PRINT#-2,CHR$(31);"NAME";STR
ING$(24,&H5F);"DATE";STRING$(7,9
5);CHR$(30)
160 PRINT#-2,"SHEET IDENTIFICATI
ON NO.";SN(NC):PRINT#-2," "
170 PRINT#-2,CHR$(31);:RETURN
180 FORK=1TO6
190 FORS=0TO2:PRINT#-2,USING"##.
";S+L;:PRINT#-2,"          ";:NE
XTS:PRINT#-2,""
200 FORI=1TO3:A=RND(WW)+(RND(8)*
(WW+1)):U(NC,L)=A:PRINT#-2,"
 ";:PRINT#-2,USING"####";A;:PRIN
T#-2,"    ";:L=L+1:NEXTI:PRINT#-
2,""
210 FORI=1TO3:A=RND(WW):D(NC,W)=
A:PRINT#-2,"    -";:PRINT#-2,USI
NG"####";A;:PRINT#-2,"    ";:W=W
+1:NEXTI:PRINT#-2,""
220 GOSUB230:GOTO240
230 FORI=1TO3:PRINT#-2,"   -----
--    ";:NEXTI:PRINT#-2,"":RETURN
240 FORI=1TO4:PRINT#-2," ":NEXTI
,K
250 GOSUB690
260 GOTO770
270 RETURN
280 REM ADDITION SECTION
290 NC=NC+1:GOSUB30:FORI=127TO19
1STEP32:PRINT@I,EB$;:NEXT:PRINT@
192,STRING$(32,172);
300 QK$(NC)="A":PRINT@133," ADDI
TION WORKSHEETS ";:PRINT@224,"
      INPUT NUMBER SPAN":PRINTS
TRING$(32,32);:PRINT@256,"    (4
DIGITS-MAX.9999)";:INPUTWW:IF WW
>9999THEN300ELSEIF WW=0THEN NC=N
C-1:GOTO20
310 SN(NC)=TIMER:L=1:W=1
320 GOSUB150
330 FORK=1TO6
340 FORS=0TO2:PRINT#-2,USING"##.
";S+L;:PRINT#-2,"          ";:NE
XTS:PRINT#-2,""
```

THE COLORSOFT™ BUSINESS SYSTEM

INTEGRATED BUSINESS SOFTWARE DESIGNED FOR THE COLOR COMPUTER
WRITTEN FOR USE BY THE NON-ACCOUNTING ORIENTED BUSINESSMAN
CONCISE USERS MANUAL WITH SAMPLE TRANSACTIONS TUTORIAL
PROFESSIONALLY WRITTEN AND FULLY TESTED
HIGHLY USER FRIENDLY AND MENU DRIVEN
AFTER THE SALE SUPPORT

SMALL BUSINESS ACCOUNTING (Version 2.0) This sales-based accounting package is designed for the non-accounting oriented businessman. It also contains the flexibility for the accounting oriented user to set up a double entry journal with an almost unlimited chart of accounts. This package includes Sales Entry, transaction driven Accounts Receivable and Accounts Payable, Journal Entry, Payroll Disbursement, and Record Maintenance programs. Screen and hardcopy system outputs include Balance Sheet, Income Statement, Customer and Vendor Status Reports, Accounts Receivable and Payable Aging Reports, Check Register, Sales Reports, Account Status Lists, and a Journal Posting List. The number of accounts is limited only by the number of disk drives. $89.95

ACCOUNTS RECEIVABLE (Version 2.0) This package is designed to meet the requirements of most small business users. The system includes detailed audit trails and history reports for each customer, prepares invoices and monthly statements, mailing labels, aging lists, and an alphabetized customer listing. The user can define net terms for commercial accounts or finance charges for revolving accounts. This package functions as a standalone A/R system or integrates with the Small Business Accounting package to build a complete accounting/receivables system. $59.95

PAYROLL (Version 2.0) This integratable package is designed for maintaining personnel and payroll data for up to 200 hourly and salaried employees with 8 deductions each. This system calculates payroll and tax amounts, prints checks and maintains year-to-date totals. These amounts can be automatically transferred to the SBA package for financial reporting. It computes each pay period's totals for straight time, overtime, and bonus pay and determines taxes to be withheld. Additional outputs include mailing list, listing of employees, year-to-date federal and/or state tax listing, and a listing of current misc. deductions. This system is suited for use in all states except Oklahoma and Delaware. $69.95

All programs require a minimum of 32K and 1 disk drive but will take advantage of 64K and multiple drives. Each package features a hi-res 51 x 24 black on green screen. 16K versions available without hi-res screen. Specify 16K or 32K versions when ordering. Future integrated packages will include: Inventory Control, Sales Analysis, Accounts Payable.

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COLOR SOFTWARE SERVICES DIV.

BUSINESS SOFTWARE GROUP
P.O. BOX 1708
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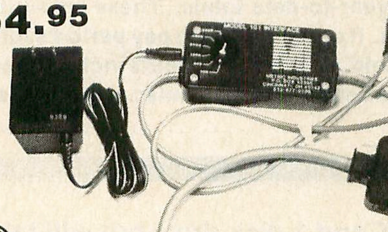
```
350 FORI=1TO3:A=RND(WW):U(NC,L)=
A:PRINT#-2,"     ";:PRINT#-2,USI
NG"####";A;:PRINT#-2,"    ";:L=L
+1:NEXTI:PRINT#-2,""
360 FORI=1TO3:A=RND(WW):D(NC,W)=
A:PRINT#-2,"    +";:PRINT#-2,USI
NG"####";A;:PRINT#-2,"    ";:W=W
+1:NEXTI:PRINT#-2,""
370 GOSUB230
380 FORI=1TO4:PRINT#-2," ":NEXTI
,K
390 GOSUB690
400 GOTO770
410 RETURN
420 REM MULTIPLICATION SECTION
430 NC=NC+1:GOSUB30:FORI=127TO19
1STEP32:PRINT@I,EB$;:NEXT:PRINT@
192,STRING$(32,172);
440 QK$(NC)="M":PRINT@130," MULT
IPLICATION  WORKSHEETS ";:PRINT@
224,"       INPUT NUMBER SPAN":P
RINTSTRING$(32,32);:PRINT@256,"
  (4 DIGITS-MAX.9999)";:INPUTWW:
IF WW>9999THEN440ELSEIF WW=0THEN
 NC=NC-1:GOTO20
450 SN(NC)=TIMER:L=1:W=1:GOSUB15
0
460 FORK=1TO6
470 FORS=0TO2:PRINT#-2,USING"##.
";S+L;:PRINT#-2,"          ";:NE
XTS:PRINT#-2,""
480 FORI=1TO3:A=RND(WW):U(NC,L)=
A:PRINT#-2,"     ";:PRINT#-2,USI
NG"####";A;:PRINT#-2,"    ";:L=L
+1:NEXTI:PRINT#-2,""
490 FORI=1TO3:A=RND(WW):D(NC,W)=
A:PRINT#-2,"    X";:PRINT#-2,USI
NG"####";A;:PRINT#-2,"    ";:W=W
+1:NEXTI:PRINT#-2,""
500 GOSUB230
510 FORI=1TO4:PRINT#-2," ":NEXTI
,K
520 GOSUB690
530 GOTO770
540 RETURN
550 REM DIVISION SECTION
560 NC=NC+1:GOSUB30:FORI=127TO19
1STEP32:PRINT@I,EB$;:NEXT:PRINT@
192,STRING$(32,172);
570 QK$(NC)="D":PRINT@133," DIVI
SION WORKSHEETS ";:PRINT@224,"
     INPUT NUMBER SPAN":PRINTSTR
ING$(32,32);:PRINT@256," ENTER '
999' FOR EASY OR '9999'":PRINT@2
```

Metric Industries

For the color computer and TDP100

Model 101 Interface $54.95

- Serial to Parallel Interface
- Works with any Centronics Compatible Printer including Radio Shack, TDP, Gemini, Epson, Gorillia and many others
- Six switch selectable baud rates (300 to 9600)
- 90 day warranty
- Power Supply included



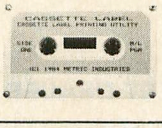
Model 102 RS-232-C Switcher

$35.95

- Switches all three data lines
- Indicator lights let you know computer is on
- 3 position switch has silver plated contacts for high reliability
- Color coded lights indicate switch position
- Color coded labels for your printer, modem etc., supplied

Cassette Label Program $6.95

- Prints five lines of information on pin-feed cassette labels
- Menu driven — easy to use



- Uses special features of your printer for standard, expanded and condensed characters
- 24 free labels included with program
- Auto centering features for each line of text
- 16K ECB required

General Items

- Gemini 10X Printer **$319.00**
- Special Save — Printer & Interface **$360.00**
- C-10 Cassettes **$7.50/dozen**
- Hard plastic boxes **$2.50/dozen**
- Pin-feed Cassette labels **$3.00 per 100**
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VIP™ Library

Personal Productivity Tools for Modern Times

RAINBOW
CERTIFICATION
SEAL

The Library Concept

State of the Art, Quality, Integrity, Compatibility and Affordability. Five things good software must possess. Five things that epitomize the **VIP Library™**. Each program is the diamond of its class, true excellence. These programs are first in features, first in power, first in memory, and all are affordably priced. And for your convenience all disk programs can be backed up.

State Of The Art

All **Library** programs are written in machine code specifically for the Color Computer, to work without the interference of a separate operating system such as FLEX. From this comes speed and more workspace for you. Unlike other programs for the Color Computer which are said to be 64K compatible, **VIP Library™** programs are not limited to between 24 and 30K of workspace in 64K. **Library** programs have Memory Sense with BANK SWITCHING to fully use all 64K, thus giving up to 51K with a disk version and up to 53K with a tape version.

Easy To Use

Each **Library** program was carefully designed to be extremely easy to use. Built-in on-screen help tables are at your fingertips, as are menus of all kinds. Every effort is made to use logical, intuitive and easy-to-remember commands. The manuals have been thoughtfully prepared to cover every aspect of the program, and they have complete tutorials to get you going right away. We set the standard!

Lowercase Displays

State-of-the-Art graphics allow instant use of four display colors, and eight lowercase displays featuring descending lowercase letters. You can select from 51, 64 or 85 columns by 21 or 24 lines per screen, with wide or narrow characters in the 64 display. These screens provide a pleasant and relaxing way to perform your tasks, with as much text on the screen as is possible. Each program is easy to learn and a joy to use. We take pride in the stringent testing done to make these programs perform flawlessly. Every feature, every convenience, sleek, simple and elegant.

> *". . . PICTURE getting your instantaneous investment report over the phone, using it in your spreadsheet calculation, generating a report, and writing a memo including that report and data from your database with your word processor, and all this with VIP Library™ programs . . ."*

Total Compatibility

All **Library** programs are compatible. Transfer and use of files between programs is easy and carefree. What's better, when you have learned one program the others will come easy. And every program is the best of its kind available.

The Library Programs

For your writing needs is the **VIP Writer™**, and its spelling checker, the **VIP Speller™**. For financial planning and mathematical calculations you can use the **VIP Calc™**. To manage your information and send multiple mailings there is the **VIP Database™**. For sending all these files to and from home or the office and for talking to your friends you can have the **VIP Terminal™**. Finally, to fix disks to keep all your **Library** files in good repair we offer the **VIP Disk-ZAP™**.

Mini Disk Operating System

The Disk versions each have a Mini Disk Operating System which will masterfully handle from 1 to 4 drives. It offers smooth operation for such features as the ability to read a directory, display free space on the disk, kill files, save and automatically verify files, and load, rename and append files. **Library** programs simply do not have the limitations of BASIC.

Professionalism

The **Library** will grace your work area with the professionalism it deserves. Welcome the **VIP Library™** into your home and office.

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VIP Writer™

Includes VIP Speller at no additional cost!!

(Formerly Super "Color" Writer II)
By Tim Nelson

RATED TOPS IN RAINBOW, HOT COCO, COLOR COMPUTER MAGAZINE & COLOR COMPUTER WEEKLY

The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the **Library: The VIP Writer™**. Because of its undisputed superiority over all Color Computer word processors, it was selected by Dragon Data Ltd. of England and TANO in the U.S., to be the Official Word Processor for their line of Dragon microcomputers.

The result of two years of research, the **VIP Writer™** offers every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the hi-res display, workspace and compatibility features built into the **Library** the **Writer** is also the most usable.

". . . Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless . . . Features for the professional, yet it is easy enough for newcomers to master . . . Certainly one of the best word processors available for any computer . . ." October 1983 "Rainbow"

"Word processing with VIP Writer is like driving a high-performance vehicle . . . This Ferarri of a package has more features than Telewriter, Easywriter (for the IBM PC), or Applewriter." October 1983 "Hot CoCo"

The **Writer** will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance. You can even *automatically* print multiple copies.

Although all versions feature tape save and load, the disk version provides the Mini Disk Operating System common to the whole **Library**, plus disk file linking for continous printing.

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 61K of workspace with the rompak version and 50K with the disk version.
- TRUE FORMAT WINDOW allowing you to preview the printed page ON THE SCREEN BEFORE PRINTING, showing centered lines, headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
- A TRUE EDITING WINDOW in all 9 display modes for those extra wide reports and graphs (up to 240 columns!).
- FREEDOM to imbed any number of PRINTER CONTROL CODES anywhere, **EVEN WITHIN JUSTIFIED TEXT**.
- Full 4-way cursor control, sophisticated edit commands, the ability to edit any BASIC program or ASCII textfile, SEVEN DELETE FUNCTIONS, LINE INSERT, LOCATE AND CHANGE, wild card locate, up to TEN SIMULTANEOUS block manipulations, word wrap around, programmable tabs, display memory used and left, non-breakable space, and headers, footers and FOOTNOTES.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typamatic key repeat and key beep for the pros, ERROR DETECTION and UNDO MISTAKE features, 3 PROGRAMMABLE functions, auto column creation, and an instant on-screen HELP TABLE.

32K (Comes with tape & disk) $59.95

(Includes VIP Speller)

RAINBOW
CERTIFICATION SEAL

NEW

VIP Speller™

WITH A 50,000 WORD INDEXED DICTIONARY!

By Bill Argyros

RAINBOW

Gone are the eyestrain, boredom and fatigue from endless proofreading. **VIP Speller™** is the fastest and most user-friendly speller for your CoCo. It can be used to correct any ASCII file — including **VIP Library™** files and files from **Scripsit™** and **Telewriter™**. It automatically checks files for words to be corrected, marked for special attention or even added to the dictionary. You can even view the word in context, with upper and lowercase. **VIP Speller™** comes with a specially edited **50,000** word dictionary which, unlike other spellers for the CoCo, is indexed for the greatest speed. The shorter your file, the quicker the checking time. And words can be added to or deleted from the dictionary or you can create one of your own. **VIP Speller™** also comes with the **Library's** mini disk operating system for easy disk manipulation.

32K DISK ONLY $39.95

Lowercase displays not available with this program.

VIP™ Library

VIP Calc™

RAINBOW
CERTIFICATION SEAL

(Formerly Super "Color" Calc)
By Kevin Herrboldt

You can forget the other toy calcs — The real thing is here! No other spreadsheet for the Color Computer gives you:

- **20 ROWS BY 9 COLUMNS ON THE SCREEN AT ONCE**
- **LOWERCASE LETTERS WITH DESCENDERS**
- **UP TO 16 CONCURRENT DISPLAY WINDOWS**
- **FLOATING-POINT MATH**
- **CHOICE OF SINGLE AND DOUBLE PRECISION**
- **WORKS WITH BASE 2, 10, AND 16 NUMBERS**
- **UP TO 512 COLUMNS BY 1024 ROWS**
- **USER DEFINABLE WORKSHEET SIZE FOR MORE MEMORY**
- **LOCATE FUNCTION TO FIND CHECK NUMBERS, NAMES, ETC.**
- **COLUMN/ROW MULTIPLE SORTS**
- **PROGRAMMABLE FUNCTIONS**
- **IMBEDDABLE PRINTER CONTROL CODES**
- **21 ALTERABLE PRINT FORMAT PARAMETERS**
- **ON-LINE HELP TABLES**
- **DOES NOT REQUIRE FLEX OR BASIC**

VIP Calc™ is truly the finest and easily the most powerful electronic worksheet and financial modeling program available for the Color Computer. Now every Color Computer owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some, WITH USABLE DISPLAYS. Use Visicalc templates with **VIP Calc™!**

There's nothing left out of **VIP Calc™**. Every feature you've come to rely on with VisiCalc™ is there, and then some. You get up to **5 TIMES** the screen display area of other spreadsheets for the Color Computer and Memory-Sense with **BANK SWITCHING** to give not just 24, or 30, but **UP TO 33K OF WORKSPACE IN 64K!!!** This display and memory allow you the FULL SIZE, USABLE WORKSHEETS you require. You also get: User definable worksheet size, up to 512 columns by 1024 rows! * Up to **SIXTEEN VIDEO DISPLAY WINDOWS** to compare and contrast results of changes * **16 DIGIT PRECISION** * Sine, Cosine and other trigonometric functions, Averaging, Exponents, Algebraic functions, and **BASE 2, 8, 10 or 16** entry * Column and Row, Ascending and Descending **SORTS** for comparison of results * **LOCATE FORMULAS OR TITLES IN CELLS** * Easy entry, replication and block moving of frames * Global or Local column width control up to 78 characters width per cell * Create titles of up to 255 characters per cell * Limitless programmable functions * Typamatic Key Repeat * Key Beep * Typeahead * Print up to 255 column worksheet * Prints at any baud rate from 110 to 9600 * Print formats savable along with worksheet * Enter PRINTER CONTROL CODES for customized printing with letter quality or dot matrix printer * Combine spreadsheet tables with **VIP Writer™** documents to create ledgers, projections, statistical and financial reports and budgets.

Both versions feature Tape save and load, but the disk version also has the Mini Disk Operating System of the entire **Library**.

32K (Comes with tape & disk) $59.95

32K has no hi-res displays, sort or edit.

Check These Library Prices:

- Fully CoCo 2 Compatible
- Nine Display Formats: 32 by 16 51, 64, 85 by 21 or 24
- True Lowercase & Descenders
- Four Different Display Colors
- 32 & 64K Compatible
- Memory Sense - Bank Switching
- Up to 51K Disk, 53K Tape
- Mini Disk Operating System
- Compatible With All Printers

VIP Terminal™

(Formerly Super "Color" Terminal)

RATED BEST IN JANUARY 1984 "RAINBOW"

RAINBOW CERTIFICATION SEAL

By Dan Nelson

From your home or office you can join the communication revolution. The **VIP Terminal™** opens the world to you. You can monitor your investments with the Dow Jones Information Service, or broaden your horizons with The Source or Compuserve, bulletin boards, other computers, even the mainframe at work.

For your important communication needs you've got to go beyond software that only lets you chat. You need a smart termnal so that you can send and receive programs, messages, even other **VIP Library™** files. **VIP Terminal™** has "more features than communications software for CP/M, IBM and CP/M 86 computers." Herb Friedman, Radio Electronics, February 1984.

FEATURES: Choice of 8 hi-res lowercase diplays * Memory-Sense with BANK SWITCHING for full use of workspace * Selectively print data at baud rates from 110 to 9600 * Full 128 character ASCII keyboard * Automatic graphic mode * Word mode (word wrap) for unbroken words * Send and receive **Library** files, Machine Language & BASIC programs * Set communications baud rate from 110 to 9600, Duplex: Half/Full/Echo, Word length: 7 or 8, Parity: Odd/Even or None, Stop Bits: 1-9 * Local linefeeds to screen * Save and load ASCII files, Machine Code & BASIC programs * Lowercase masking * 10 Keystroke Multiplier (MACRO) buffers to perform repetitive pre-entry log-on tasks and send short messages * Programmable prompt or delay for send next line * Selectable character trapping * Send up to ten short messages (KSMs), each up to 255 characters long, automatically, to save money when calling long distance.

All versions allow tape load and save of files and KSMs, but the disk version also has the Mini Disk Operating System common to the **Library**.

32K (Comes with tape & disk) $49.95

(Tape comes in 16K but without hi-res displays)

Softlaw

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Minneapolis, Minnesota 55420 U. S. A.

TRS-80 is a trademark of Tandy Corp. VisiCalc is a trademark of VisiCorp.

VIP Database™

(Formerly Super "Color" Database)

INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mailmerge capabilities. Inventory, accounts, mailing lists, family histories, you name it, the **VIP Database™** will keep track of all your data, and it will merge **VIP Writer™** files.

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. Records can be searched for specific entries, using multiple search criteria. With database form merge you may also combine files, sort and print mailing lists, print "boiler plate" documents, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Unlimited print format and report generation with the ability to imbed control codes for use with all printers.

As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

32K DISK $59.95

64K Required for math package & mail merge

RAINBOW CERTIFICATION SEAL

VIP Disk-ZAP™

(Formerly Super "Color" Disk-ZAP)

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

RAINBOW

By Tim Nelson

Your database file disk, form letter disk, or BASIC program disk goes bad. An I/O error stops loading, or even backing up of the disk. Weeks, even months of work sit on the disk, irretrievable. Now catastrophic disk errors are repairable, quickly and with confidence, using the **VIP Disk-ZAP™**. It is the ultimate repair utility for simple and quick repair of all disk errors. Designed with the non-programmer in mind, the **VIP Disk-ZAP™** will let you retrieve all types of bashed files, BASIC and Machine Code programs.

This high-speed machine code disk utility has a special dual cursor screen display to look at the data on your disk. You are able to: Verify or modify disk sectors at will * Type right onto the disk to change unwanted program names or prompts * Send sector contents to the printer * Search the entire disk for any grouping of characters * Copy sectors * Backup tracks or entire disks * Repair directory tracks and smashed disks * Full prompting to help you every step of the way * 50-plus page Operators Manual which teaches disk structure and repair.

16K DISK $49.95

Lowercase displays not available with this program.

VISA

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MAIL ORDERS: $3.00 U.S. Shipping ($5.00 CANADA; $10.00 OVERSEAS). Personal checks allow 3 weeks.

All Disk Programs are also available on 3" Diskettes for the Amdek Color AMDISK-III Micro-Floppy Disk System for an additional $3.00 each.

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```
88,STRING$(32,32);
580 PRINT@288,STRING$(32,32);:PR
INT@288,"      FOR DIFFICULT";:I
NPUTWW:IF WW>9999THEN570ELSEIF W
W=0THEN NC=NC-1:GOTO20
590 SN(NC)=TIMER:L=1:W=1
600 GOSUB150
610 FORK=1TO6
620 PRINT#-2," ";:FORS=0TO2:PRIN
T#-2,USING"##.";S+L;:PRINT#-2,"
      ";:NEXTS:PRINT#-2," "
630 PRINT#-2,"      ";:FORI=1TO3
:FORYY=1TO6:PRINT#-2,CHR$(&H5F);
:NEXTYY:PRINT#-2,"     ";:NEXTI
640 FORI=1TO3:IN=RND(INT(WW/100)
):A=RND(INT(WW/100)):B=A*IN:U(NC
,L)=B:D(NC,L)=A:PRINT#-2,USING"#
###";A;:PRINT#-2,")";:PRINT#-2,U
SING"####";B;:PRINT#-2,"   ";:L=
L+1:NEXTI:PRINT#-2,""
650 FORI=1TO5:PRINT#-2," ":NEXTI
,K
660 GOSUB690
670 GOTO770
680 RETURN
690 PRINT" PRESS <ENTER> FOR ANS
WER SHEET    OR <M> FOR MORE WOR
KSHEETS"
700 'RETURN
710 X$=INKEY$:IFX$="M" THEN20ELS
EIFX$=CHR$(13)THENRETURN ELSEIFX
$=" "THENPRINT#-2," " ELSE 710
720 GOTO710
730 PRINT@384,STRING$(32,172);"
PRESS <E>ND OR <A>NSWER SHEETS":
PRINTSTRING$(32,163);STRING$(31,
128);:POKE1535,128
740 X$=INKEY$:IFX$="E"THEN850ELS
EIFX$="A"THEN770ELSEIFX$=CHR$(13
)THEN20ELSE740
750 CLS5:PRINT@192,STRING$(32,17
2);CHR$(128)"ready";:POKE1254,32
:PRINT@231,"printer";:POKE1262,3
2:PRINT@239,"then";:POKE1267,32:
PRINT@244,"press";:POKE1273,32:P
RINT@250,"enter"CHR$(128)STRING$
(32,163);
760 X$=INKEY$:IFX$=CHR$(13)THEN7
70ELSE760
770 CLS5:PRINT@192,STRING$(32,17
2);"now";:POKE1251,32:PRINT@228,
"printing";:POKE1260,32:PRINT@23
7,"coded";:POKE1266,32:PRINT@243
,"answer";:POKE1273,32:PRINT@250
```

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```
,"sheets";STRING$(32,163);:IF NC
=0THEN850
780 NW=NC:FOR NC=1 TO NW
790 IF QK$(NC)="S"THEN810ELSEIF
QK$(NC)="A"THEN820ELSEIF QK$(NC)
="M"THEN830ELSEIF QK$(NC)="D"THE
N840
800 FOR JK=1TO3:PRINT#-2," ":NEX
T JK:NEXT NC:RUN
810 PRINT#-2,CHR$(30)"SHEET #";S
N(NC):FORI=1TO13STEP6:FORL=0TO5:
PRINT#-2,TAB(2+(L*12));:PRINT#-2
,USING"##.";I+L;:PRINT#-2," ";U(
NC,I+L)-D(NC,I+L);:NEXTL:PRINT#-
2,"":NEXTI:GOTO800
820 PRINT#-2,CHR$(30)"SHEET #";S
N(NC):FORI=1TO13STEP6:FORL=0TO5:
PRINT#-2,TAB(2+(L*12));:PRINT#-2
,USING"##.";I+L;:PRINT#-2," ";U(
NC,I+L)+D(NC,I+L);:NEXTL:PRINT#-
2,"":NEXTI:GOTO800
830 PRINT#-2,CHR$(30)"SHEET #";S
N(NC):FORI=1TO16STEP3:FORL=0TO2:
PRINT#-2,TAB(9+(L*20));:PRINT#-2
,USING"##.";I+L;:PRINT#-2,USING"
###,###,###";U(NC,I+L)*D(NC,I+L)
;:NEXTL:PRINT#-2,"":NEXTI:GOTO80
0
840 PRINT#-2,CHR$(30)"SHEET #";S
N(NC):FORI=1TO13STEP6:FORL=0TO5:
PRINT#-2,TAB(0+(L*13));:PRINT#-2
,USING"##.";I+L;:PRINT#-2,USING"
#,###,###";U(NC,I+L)/D(NC,I+L);:
NEXTL:PRINT#-2,"":NEXTI:GOTO800
850 CLS0:SCREEN0,0:END
```

```
140...... 140
280...... 175
END .... 214
```

Listing 2:

```
1 '*******************************
2 '* WRITTEN MATH PROBLEMMAKER *
3 '* BY FRED B. SCERBO (C)1983 *
4 '* ILLUSTRATED MEMORY BANKS *
5 '*******************************
60 CLS
70 DIM A$(50),B$(20),G(12,7)
80 FORI=1TO50:READ A$(I):NEXT
90 FORI=1TO20:READ B$(I):NEXT
100 FORI=1TO12:G(I,1)=RND(50):G(
I,2)=RND(9)+1:G(I,3)=RND(20):G(I
,4)=(RND(49)+50)/100:NEXTI
110 FORI=1TO11STEP2:G(I,5)=RND(1
0):G(I,6)=RND(10):G(I,7)=(RND(49
)+50)/100:G(I+1,5)=(RND(4)+2)*5:
```

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ABOUT THE AUTHOR

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```
NEXTI
120 PRINTSTRING$(32,"=");" WRITT
EN MATH PROBLEM GENERATOR.
 BY FRED B. SCERBO          ";STRI
NG$(32,"="):PRINT@164,"PREPARE P
APER AND PRESS":PRINT@204,"<ENTE
R>."
130 IFINKEY$=CHR$(13)THEN140ELSE
130
140 PRINT#-2,"NAME..............
................................
..............DATE..........":PR
INT#-2," ":FORI=1TO11STEP2:ZZ=RN
D(-TIMER)
150 PRINT#-2,USING"##.";I;:PRINT
#-2," ";A$(G(I,1));" NEEDS TO PU
RCHASE";G(I,2);B$(G(I,3));" ON S
ALE AND PRICED AT A COST OF"
160 PRINT#-2,"    ";:D=(G(I,4)):
PRINT#-2,USING"$.##";D;:PRINT#-2
," EACH. HOW MUCH WILL THE TOTAL
 BILL BE IF";G(I,5);B$(G(I,6));"
 ARE ALSO"
170 PRINT#-2,"     PURCHASED AT A
 COST OF ";:D=(G(I,7)):PRINT#-2,
USING"$.##";D;:PRINT#-2," EACH?"
180 FOR J=1TO6:PRINT#-2," ":NEXT
J
```

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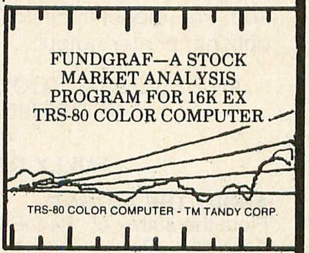
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```
190 SN=G(I+1,1):PRINT#-2,USING"#
#.";I+1;:PRINT#-2," ";A$(SN);" W
ANTS TO PURCHASE";G(I+1,2);B$(G(
I+1,3));" AT A SALE COST OF JUST
 ";:D=(G(I+1,4)):PRINT#-2,USING"
$.##";D
200 PRINT#-2,"     EACH. HOW MUCH
 MONEY WILL ";A$(SN);" HAVE LEFT
 FROM ";:H=(G(I+1,5)):PRINT#-2,U
SING"$##.##";H;:PRINT#-2," ?"
210 IF I+1=12 THEN 250
220 IF I=5THEN240
230 FORJ=1TO7:PRINT#-2," ":NEXTJ
240 IF I=5 THENGOSUB330
250 NEXTI
260 FOR T=1TO8:PRINT#-2," ":NEXT
 T:Z=0:FOR Y=1TO7STEP6
270 FORI=Y TO Y+5STEP2
280 PRINT#-2,TAB((I-Z)*12-9);:PR
INT#-2,USING"##.";I;:PRINT#-2,US
ING"$###.##";(G(I,2)*G(I,4))+(G(
I,5)*G(I,7));
290 PRINT#-2,TAB((I+1-Z)*12-9);:
PRINT#-2,USING"##.";I+1;:PRINT#-
2,USING"$###.##";(G(I+1,5)-(G(I+
1,4)*G(I+1,2)));
300 NEXTI:Z=6:PRINT#-2:NEXTY
310 PRINT:PRINT"        ANOTHER SHE
ET (Y/N) ?"
320 IFINKEY$="Y"THEN RUN ELSE IF
 INKEY$="N"THEN6000ELSE320
330 PRINT:PRINT"  PREPARE SECOND
 SIDE AND PRESS   <ENTER> TO PR
INT REMAINDER."
340 X$=INKEY$:IFX$=CHR$(13)THEN3
50ELSE340
350 RETURN
1000 DATA HARRY,SAM,DEBRA,SALLY,
BILL,BOBBY,RHONDA,LUCY,WADE,DALE
1010 DATA DARLENE,MILTON,NOREEN,
JANET,BARBARA,RUSTY,LARRY,JOE,MA
RK,DEREK,JAY,GLEN,TERRY,JIM,TORY
1020 DATA RAY,STEVE,DONNA,ADAM,J
ENNIE,BRENDA,JOHN,PETE,LEE,PAUL,
MARYANN,ROSE,ANNIE,KAY,FLO,IRVIN
G,DICK,ROGER,CHRIS,TIM,ERIC,GORD
ON,DAN,TOM,DARRIN
1030 DATA CARROTS,CANDY APPLES,S
PICE CAKES,CANDY BARS,LETTUCE HE
ADS,BATTERIES,PAPERBACK NOVELS,B
OXES OF TISSUES,PAPER TOWELS,CAR
PET LINERS,COFFEE ROLLS,BARS OF
SOAP
1040 DATA ORANGES,TV DINNERS,BAG
S OF CHIPS,LUNCH SNACKS,CUPS OF
YOGURT,BLANK TAPES,MAGAZINES,VIT
AMIN PACKS
6000 CLS:END
```

The Rise Of The Microcomputer

By Michael Plog, Ph.D.
Rainbow Contributing Editor

Congratulations to South Dakota and Minnesota! Those states have a higher microcomputer per student ratio than any other state in the nation. In South Dakota, there are 62 students for every microcomputer in a school. In Minnesota, there are 63 students for each microcomputer. Nationwide, each school microcomputer is "shared" by 136.7 students (Did you ever wonder about that "point seven" student?) The poor state of Hawaii has only 156 microcomputers in the entire school system in the state, with 1,072 students for each microcomputer. Hawaii has less than one micro per school, while Jefferson County, Colo., has 15 microcomputers per school.

There are nine states with less than 100 students per microcomputer: Colorado, Iowa, Kansas, Minnesota, Montana, South Dakota, Utah, Vermont, and Wyoming. Seven states have between 200 and 400 students per microcomputer; all are in the southeast part of the country: Alabama, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. Thirty-four states (including the District of Columbia) have between 100 and 200 students per microcomputer.

These facts are brought to you by a research study conducted by Quality Education Data, Inc., located in Denver, Colo. They conducted a telephone survey of every school district in the country. This is a massive undertaking, and the company has provided invaluable information to people interested in microcomputer research. Of course, by the time you read this, the numbers will have changed; schools are purchasing microcomputers every day.

Across the nation, about two-thirds (66.5 percent) of schools have microcomputers. Across all school types, student enrollment is an extremely strong predictor of microcomputer use. The larger the enrollment, the more likely the school is to have microcomputers. Also, the grade level of the school is a strong predictor of microcomputer use. Senior high schools are more likely to have microcomputers than junior high schools, which are more likely to have microcomputers than elementary schools. For example, 91.1 percent of senior high schools with enrollment over 1,500 students have microcomputers. About a third (33.9 percent) of elementary schools with less than 100 students have microcomputers.

Use of microcomputers has increased at all school levels during the past three years. The following table shows the percentages of schools in each category having microcomputers during each of three years:

	Elementary	**Junior High**	**Senior High**
1982	9.4%	20.3%	42.6%
1983	27.4%	46.2%	62.5%
1984	61.0%	72.2%	78.5%

The growth of microcomputers in elementary schools is phenomenal! Of course, all school levels show an increase, even a rapid increase, in microcomputer use. But in just two years, this country has gone from less than one out of 10 elementary schools having microcomputers to more than three out of five elementary schools with microcomputers.

What are elementary schools doing with all those microcomputers? Well, we can find out from a survey of members of the National Association of Elementary School Princi-

---

(Michael Plog received his Ph.D. degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district, and currently is employed at the Illinois State Board of Education.)

pals. The results of that survey showed that 29 percent use the school's microcomputer exclusively for management purposes; while 50 percent use the equipment to teach computer literacy and drill in other subjects. I do not know how many elementary principals are members of this organization, nor what type of school is most represented by this group. I would hazard a guess that the members of the organization would be more likely to have microcomputers in their schools than elementary principals who are not members.

Let's get back now to the research study by Quality Education Data, Inc. One of their findings related to the school's community type. Urban and suburban schools are more likely to have microcomputers than rural schools. Nationwide, 72.6 percent of suburban schools have micros; 69.1 percent of urban schools; and 59.5 percent of rural schools. Typically, suburban and urban school districts have more funds to spend than rural school districts. Also, parents in suburban and urban areas will be more likely to work in a job requiring some knowledge of microcomputers than parents in rural areas. This is probably changing quickly, however. There is a large increase in computer software for farming and related industries.

Microcomputer use is also related to ethnic minority enrollment of a school. The greater the percentage of black students in a school, the less likely that school is to have microcomputers. The same is true of Hispanic students —the smaller the percentage of Hispanic enrollment, the more likely the school will own microcomputers. The report did not cover other ethnic groups, such as Asians and American Indians.

After considering the data, it is easy to conclude that microcomputers in schools is not a passing fad. Purchases of microcomputers are increasing in all areas, even though inequities still exist (and probably will in the future). Schools are spending money on microcomputers, and every indication is that educational leaders will continue to invest funds for this type of educational aid.

The report also contained information about brands of microcomputers. The predominant brand is Apple, but we knew that already. The different Radio Shack types of computers were not differentiated. A total of 35.1 percent of school districts in the country own Radio Shack computers, including Models I, II, III, and our favorite, the Color Computer.

School districts are not the only educational institutions interested in microcomputers. Several organizations involved with education have taken an interest in microcomputers, and are using electronic technology to help their members. Probably the most prestigious educational group is the American Education Research Association (AERA). The AERA includes educational leaders from all over the world, not just the United States. While membership includes teachers, the organization is mostly composed of superintendents, university-type people, and researchers. Recently, a Special Interest Group (SIG) for microcomputers in education was founded. This SIG has just started a teleconferencing network for members to share resources and ideas.

Another group, the Midwestern AERA, has a SIG for microcomputers, available to members through CompuServe. Of course, CompuServe has a SIG devoted to education, which anyone can access.

Researchers are not the only people interested in using microcomputers. It is difficult these days to attend any type of educational conference without seeing a session on microcomputers. Many educational special interest groups have networks which use microcomputers to share information. The field of special education (education for the handicapped) has an electronic communication system called SpecialNet. The bilingual community supports the network BLNG (pronounced "bling"). Vocational education has a similar electronic "board" for interested parties.

What use are all these special interest electronic communication systems? Well, take just one example to illustrate the possibilities. A bill affecting one of these groups is scheduled for debate and voting in Congress. Representatives in Washington put this notice on the electronic system. People all over the country read the notice that same day. They can immediately call their representatives and express their views. Now, if you were a representative, and suddenly received a few hundred telephone calls urging passage of that bill, plus possibly a thousand telegrams, would that not help you decide to support the bill? It has apparently worked in the past, and every indication is that such activities are extremely powerful.

A second, more mundane (but not less important) example can be given. A special education director in a local school needed to change the budget provided by the state education agency. The director composed a letter requesting this change, and sent it via electronic mail to the state education agency. The next day, the state agency sent approval of the change, also via electronic mail. The normal procedure would have been to send the request through the postal service, requiring several days (or weeks) for the entire process. As a result, a teacher can be hired and serving students in the same amount of time that would be taken just to get approval to open a new position.

As a third example, consider children of migrant workers, and their schooling. These children move around the country with the different harvest seasons. Their parents work for a while in one area, then move on to another job. Migrants usually cover several states during the course of a year. Migrant children can receive education in many school districts during any single year. In fact, the family may have moved on to another job before past school records are received. Well, no longer, thanks to electronic communication. There is a central repository of records of migrant school children, which any local district (or state education agency) can contact. The date after a child enters a new school, past school records can be printed for the local teacher to view. This means the teacher knows what subjects the child was taking last week, what level of achievement the child demonstrated, and what special handling may be required. Information like this is invaluable for a teacher.

Educational use of microcomputers covers a lot more than just classrooms. Our current technology is valuable for many facets of education, including (but not limited to) classroom instruction.

There is really no point, no editorial stand, to the column this month. The purpose of the article is to share information with you; information you may be able to use in your local area or just for your own store of knowledge. I hope the information is worthwhile to you. If you can use it, please let me know. My address is 829 Evergreen, Chatham, IL, 62629.

Letters, Books And Dreams Of The Future

By Bob Albrecht and Ramon Zamora
Rainbow Contributing Editors

"School Is In The Heart of a Child" is for parents of quite young children. We want to help you work and play with your three- to eight-year-old child and learn to use computers as a joyful family experience. We want to suggest ways to incorporate the home computer as another means to encourage your child's independence, growth, and control over his own life. See the pride on her face as she directs the computer to do what she with deliberation selects. See her head gears switch to "on" as she progresses step-by-step with your presence and caring direction.

We will explore (we hope, with *your* help) the following:

- Specific "teaching" techniques so that the discovery can be the child's own.
- Critical evaluation of software based on extensive playtesting in family and related environments.
- Additional resources to consult: books, magazines, software publishers, networks, etc.
- Suggestions for interludes and fun times away from the computer (a must): call the librarian for specific information; watch a TV program together and discuss it; work together as volunteers in a community project; take a spring (or fall or winter or summer) awareness walk . . .
- Whatever we learn from families we work with in Menlo Park or from you, our readers. Let's pool our knowledge. Let's share our experiences as we all learn from our children.

We also provide small programs you can type in and use right now.

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(Well-known author Bob Albrecht also writes the "Game Master's Apprentice" feature for The Rainbow each month. Ramon Zamora is author and co-author of several books, co-founder of ComputerTown USA!, *and currently designing computer games for kids at Child Ware Corp. in Menlo Park, Calif.)*

Farewell, Fran and Hello, Ramon

Fran's blithe spirit has decided against jousting with monthly deadlines, so she has turned over her lance to Ramon Zamora. Fran and Mariko will still be around, however, to lend help and inspiration to all of us in the "School Is In the Heart of a Child" project.

Ramon is author or co-author of several books, co-founder of ComputerTown, USA!, and currently designing computer games for kids at ChildWare Corporation in Menlo Park, Calif. Welcome, Ramon, to RAINBOW's computer sandbox.

We love the letters!

Thanks again, people, for sending us letters about your experiences with your kids and your CoCo. More, please. If it is okay for us to reprint all or part of your letter, please include permission when you write to us. Here is a letter from Denise Lambird sharing her experiences in CoCo play with her 18-month-old son!

Dear Fran and Bob:

As the parent of a very young child, I would like to say that I found your column in THE RAINBOW March issue to be one of the greatest interest to me.

We just recently purchased the TRS-80 Color Computer, having decided that, since my son will be growing up in a world of computers, it would be a good idea to begin learning myself to be able to help him learn. Although you refer to your column as being designed for the age group from three to eight, my son David, who is only 18 months old, finds the computer to be thoroughly fascinating. Previous to purchasing the computer, we had gotten him several books designed for his age group and attempted to read to him, showing him the pictures as we went. However, being a very active little boy, he did not find this the least bit interesting. But he thoroughly enjoys sitting at the keyboard and watching on the TV the various things that appear when he pushes the keys. As a matter of fact, you almost have to fight him to get to use it yourself.

I know 18 months may seem a little early for a child to start using one, but we purchased the software *Early Games for Young Children* and use it quite often. He finds the *Draw* program to be great fun and I have found that, with a lot of patience pointing at the picture and then at the top row of numbers, he is learning to distinguish the difference between numbers in the "match the numbers" program. He may only get three or four right out of 10 attempts, but when he gets one right, I clap and tell him that was very good, which makes him laugh with delight and he wants to try again. You can see the concentration on his face as he keeps looking back and forth for the right one — yet he really enjoys doing it.

David is my first child and I am only now realizing just how much they really can learn at such young ages and wish that there were more programs designed with colors and sounds to interest and teach the very young.

I like your idea of a bulletin board for sharing children's programs and think it would be wonderful. We don't have a modem and honestly, since I am just learning, I don't know how to use one. But, if such a project were to come into existence I would buy a modem and learn how to use it.

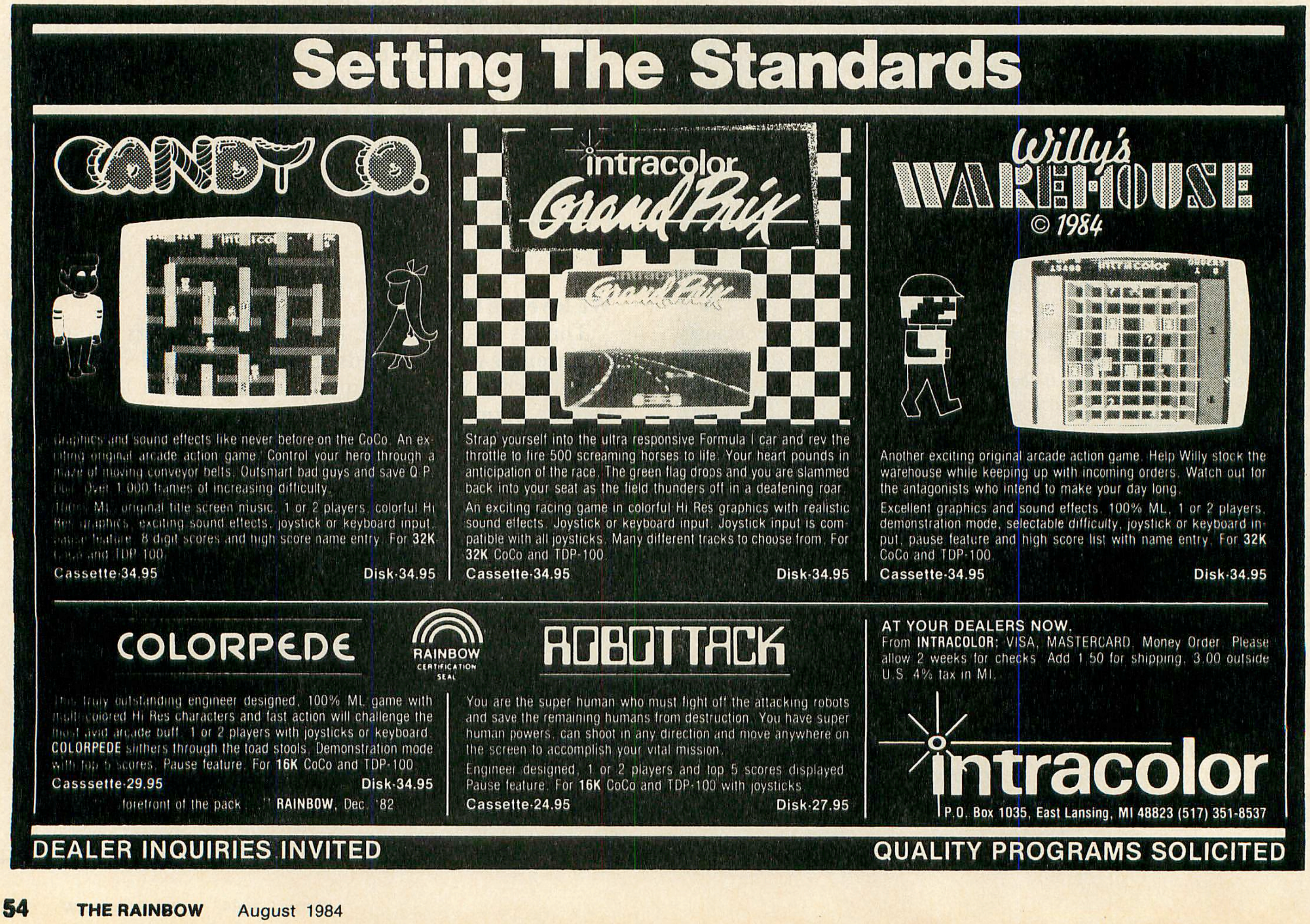
Please let me know of any programs that my son and I might find helpful. Also, please encourage more parents of the very young to let them use the CoCo, too. Even though they haven't developed much speaking skill yet, they still understand, learn and like to be a part of what the older children and parents are doing.

Thanks again for the wonderful column and any information you can give will be gratefully appreciated. As I said, my son and I are both just learning.

Denise A. Lambird

Thanks, Denise. We covered *Early Games* in the July 1984 issue of THE RAINBOW. It is from Counterpoint Software, Inc., Suite 218, 4005 West Sixty-Fifth Street, Minneapolis, Minn., 55435.

Denise, since you are "just learning," we will send you a copy of Bob's beginner's book, *TRS-80 Color BASIC*, and for David, a friendly, cuddly stuffed dragon.



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Willy's WAREHOUSE © 1984

Another exciting original arcade action game. Help Willy stock the warehouse while keeping up with incoming orders. Watch out for the antagonists who intend to make your day long.

Excellent graphics and sound effects. 100% ML, 1 or 2 players, demonstration mode, selectable difficulty, joystick or keyboard input, pause feature and high score list with name entry. For **32K** CoCo and TDP-100.

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COLORPEDE

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This truly outstanding engineer designed, 100% ML game with multi-colored Hi Res characters and fast action will challenge the most avid arcade buff. 1 or 2 players with joysticks or keyboard. **COLORPEDE** slithers through the toad stools. Demonstration mode with top 5 scores. Pause feature. For **16K** CoCo and TDP-100.

Casssette-29.95 **Disk-34.95**

"... forefront of the pack ..." **RAINBOW**, Dec. '82

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DragonSmoke

An important new book, hot off the press: *Parents, Kids, and Computers* by Lynne Alper and Meg Holmberg — 145 pages of good information for only $4.95. Lynne is a math and computer teacher who has been sharing computer fun and learning with her own children since 1980, when her kids were five, seven, and nine years old. Meg is a technical writer and editor who works closely with educators who are developing new ways for children to learn with computers.

From the Preface:

> This book is for parents who want their kids to know about computers, but aren't sure where to begin learning about them. It's also for parents who have already purchased a home computer and wonder what more their children could be doing with it than playing arcade-like games.
>
> Some parents want to know how their children can use a computer on their own [Bob: *Solo* mode]. Others might also want to know how they can work with their children on the computer [Bob: *Dual* mode]. This book is for both.

Here are a few chapter titles:

1) The Computer: Opportunity for Learning
2) Simulations — Windows on the World
3) Learning Games
4) Programming Is Kid Stuff
5) Computers and Writing
6) Working With Your Child
7) Girls and Computers
10) Where to Find Good Programs
13) Computers in the Schools

We recommend this book. Get it at your local bookstore or from the publisher: SYBEX, Inc., 2344 Sixth Street, Berkeley, CA , 94710, $4.95. *Parents, Kids, and Computers* is dedicated: "To the first generation of children to grow up with computers."

Since we began this department in your favorite CoCo magazine, we have mentioned an assortment of books for you to read. Would you like an up-to-date list? If so, send a self-addressed, stamped envelope to School, P.O. Box 310, Menlo Park., CA , 94026. If you do, please include a note.

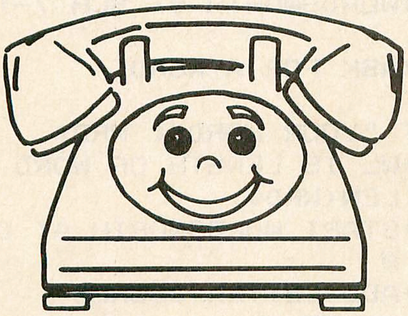
Your Dream Machine

The next generation of home computers is coming.

— From the Apple tree, an almost-clone and a mutation. The Apple IIc bundles a lot of old stuff into one neat package. Will there someday be an Apple IIz? The Macintosh brings the creative ideas of Doug Englebart and Alan Kay, for the first time, to we, the people. Read *InfoWorld*, June 11, 1984. The cover story is "Alan Kay: Portrait of a High-Tech Dreamer."

— The Japanese are coming out with part or all of the home computer built-in to the TV and the MSX machines, with 80K and 32 sprites.

— What if Radio Shack had included the TI sprite chip in the CoCo? We sure wish they had done so. Imagine: 32 sprites carrying shapes of your choice, in colors of your



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Total communications ability, 128 ASCII chars, 1200 baud, etc. Send text, graphics, BASIC, ML. Scan/Edit current data while receiving more data. Any modem. Fully supports D.C. Hayes and others. Any printer, page size, margins, etc. Override narrow text width of received data. Examine/change parameters, KSMs and disk directories at any time. Handles files which are larger than memory.

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Create, edit, print, save and load Keystroke Multipliers (KSMs). KSMs automate almost any activity. Dial via modem, sign-on, interact, sign-off. Perform entire session. Act as a message taker. KSM may include parameter changes, disk operations, editing, time delays, looping, execution of other KSMs, waiting for part-specified responses, branching based upon responses.

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choice, *without* using the "computer" in your CoCo. Then little kids could learn to do animation in a few minutes, even if they had never before touched a computer!

How many people read this magazine? 100,000? 200,000? More? Are you getting your Dream Machines? No? You can, if you put out a little energy. Send your wants to THE RAINBOW. Together, we can be a GIANT SQUEAKY WHEEL. Next time, we will squeak a bit and tell you what we would like for children, dragons, and others.

Wordsworth

In May 1984, we challenged you to answer a bunch of Wordsworth problems, using the *Sesame Street Dictionary*. Only one kid responded! Thanks, Justin Wireman, who is 4½ years old. Did your parents help you? We hope so. Thanks, Justin's parents. Here are our questions and Justin's answers.

1) What three-letter word has the smallest Wordsworth?
BAD
2) What three-letter word has the largest Wordsworth?
TRY
3) What four-letter word has the smallest Wordsworth?
FACE
4) What four-letter word has the largest Wordsworth?
YOYO
5) What is the first word (alphabetically) to have a Wordsworth of exactly 100?
CARPENTER
6) In the entire dictionary, what word has the largest Wordsworth?
HIPPOPOTAMUS
7) What is the longest word (most letters) having a Wordsworth of exactly 100?
CARPENTER, LIGHTNING, TELEPHONE

Again, thanks, Justin and his parents. *Please* (Wordsworth = 58) write to us and tell us how you and Justin did this. In the meantime, we will send Justin a friendly, cuddly, stuffed dragon.

Why only one problem-solver? Probably because we picked a dictionary only a few of you have. So, let's make it easy for all of you out there who want to play Wordsworth.

1) Tell us what children's dictionary you have.
2) Invest in an inexpensive paperback dictionary. This one: *The American Heritage Dictionary of the American Language*, paperback edition, published by Dell Publishing Co., Inc., 1 Dag Hammarskjold Plaza, New York, NY, 10017, $3.95. From now on, we will base all Wordsworth problems on this inexpensive paperback dictionary.

So, here are two programs called *Wordsworth #1 (WW1)* and *Wordsworth #2 (WW2)*. *WW1* asks for a word, assigns a letter score (LS) from one for A to 26 for Z, adds the letter scores and tells you the total score. *WW2* asks for a word, assigns a letter score (one to 26), multiplies the letter scores, and tells you the total score —well, maybe it's called the product score.

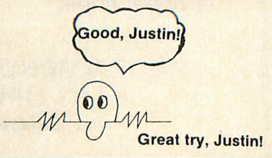
Here is *Wordsworth #1*, almost as you might have seen it in the May 1984 issue.

```
100 REM**WORDSWORTH #1 SCH 7-1
110 CLS
200 REM**ASK FOR A WORD
210 PRINT
220 INPUT "YOUR WORD"; WRD$
300 REM**WL IS LENGTH OF WORD
310 WL = LEN(WRD$)
400 REM**START WORDSWORTH AT 0
410 WW = 0
500 REM**ADD LETTER SCORES
510 FOR L=1 TO WL
520 : L$ = MID$(WRD$,L,1)
530 : IF L$<"A" THEN 570
540 : IF L$>"Z" THEN 570
550 : LS = ASC(L$) - 64
560 : WW = WW + LS
570 NEXT L
600 REM**PRINT THE WORDSWORTH
610 PRINT "THE WORDSWORTH IS" WW
700 REM**GO FOR ANOTHER
710 GOTO 210
```

Use this program to check out some of Justin's answers.

```
YOUR WORD? BAD
THE WORDSWORTH IS 7

YOUR WORD? TRY
THE WORDSWORTH IS 63
```


Good, Justin!
Great try, Justin!

***** HARVARD DESIGN PRESENTS:*****

The Disk File Duplicator: This disk utility will make copying files from one disk to any number of other disks a snap. 16K.............................. $17.95 disk

The Disk Utility: This package contains three utilities - Disk Repair, Disk+ (text movement), and Disk Inventory. 16K........................... $24.95 disk

The Directory Alphabetizer: Alphabetize disks which have hard-to-follow directories. 16K........ $15.95 disk

Lettering Services: This banner generator allows stretching of letters, printing both across and down the paper. Any printer. 32K........$17.95 cass / $20.95 disk

Shandria and Pemdicadia: This adventure is for one who appreciates real challenges, not useless frustration. First in a trilogy. 32K........$14.95 cass / $17.95 disk

The Waxen Furnace: A multi-scene, high-res graphics adventure based on underground prison escapes. Available July 30, 1984. 32K......................... $24.95 disk

We accept personal checks and money orders. Foreign orders must be in US funds. Dealer and author inquiries invited. Catalog for $1.50, deductible from next purchase. Send orders to HARVARD DESIGN, P.O. Box 40, Harvard, MA, 01451

****

YOUR WORD? . . . and so on

That's *WW1*. Most of the work and play in answering our questions is *people play*: browsing a dictionary, thinking about what to do, creating strategies — most enjoyable! People are well-equipped to do this kind of work/play.

Some of the work is grungy stuff: looking up letter scores, adding numbers. Let the CoCo do that. Now, on to *Wordsworth #2 (WW2)*. Note changes in Lines 100, 400, 410, 500, and 560.

```
100 REM**WORDSWORTH #2 SCH 7-2
110 CLS
200 REM**ASK FOR A WORD
210 PRINT
220 INPUT "YOUR WORD"; WRD$
300 REM**WL IS LENGTH OF WORD
310 WL = LEN(WRD$)
400 REM**START WORDSWORTH AT 1
410 WW = 1
500 REM*MULTIPLY LETTER SCORES
510 FOR L=1 TO WL
520 : L$ = MID$(WRD$,L,1)
530 : IF L$<"A" THEN 570
540 : IF L$>"Z" THEN 570
550 : LS = ASC(L$) - 64
560 : WW = WW*LS
570 NEXT L
600 REM**PRINT THE WORDSWORTH
610 PRINT "THE WORDSWORTH IS" WW
700 REM**GO FOR ANOTHER
710 GOTO 210
```

In *Wordsworth #2*, the letter scores are multiplied instead of added.

— The *WW2* of BAD is 2*1*4 = 8.
— The *WW2* of TRY is 20*18*25 = 9000.

If a word is in *your* children's dictionary, it is probably also in the *American Heritage Dictionary*. So you and your child first browse your dictionary, then perhaps also look it up in the one we recommend. Work together, play together to answer these questions for *Wordsworth #2*.

In the *American Heritage Dictionary*, paperback edition:

1) Pick any number of letters, two, three, four, your choice. Find the words having this many letters with the smallest *Wordsworth #2* and largest *Wordsworth #2*.

2) What is the first word (alphabetically) to have a *Wordsworth #2* exactly equal to 100, 1000, 5040, or any number *you* pick.

3) A party game. Select a number. Everyone gets 15 minutes (or 12 or 20 or . . .) to find a word whose *WW* is close to the chosen number. Winner is the one who comes closest. Try this with both *WW1* and *WW2*.

4) The numbers 2, 3, 5, 7, 11, 13, and so on are called prime numbers. The numbers 4, 6, 7, 9, 10, and so on are called composite numbers. For each composite number up to 100, find a word whose *Wordsworth #2* is equal to the composite number. For example, 50 is a composite number. Here's a word: BEE. The *WW2* of BEE is 2*2*5 = 50.

NEW

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Teachers!

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Send for our **LOGO STARTER** program. Use it with your 16K Color Computer and Color LOGO from Radio Shack (Cat. No. 26-2722).

LOGO is the best way to introduce children to computers. With **LOGO STARTER** you won't have to read a book or instruction manual. Just load the **LOGO STARTER** tape.

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All programs on cassette tape for 16K Color Computer. Extended BASIC not required. Send SASE for FREE copy of instructions for any program. Prices include postage (PA resid. add 6%). Send check to P.O. Box 210, Jenkintown, PA 19046.

b & b software

Good News for CoCo Users

Computerware is a federally registered trademark of Computerware   Box 668 • Encinitas, CA 92024 • **(619) 436-3512**

New OS-9 Utilities from Brian Lantz Computerware offers "Text Tools"

Noted OS-9 programmer and author ***Brian Lantz*** has joined with leading OS-9 vendor Computerware to offer an impressive group of ***OS-9 utilities*** called ***"Text Tools"*** which sells for ***$29.95.*** Review the list of powerful commands that follow and you will see why every OS-9 user will be adding the ***Text Tools*** to his library! You'll see similar "Unix-type" commands from other companies with prices of up to $50. But why pay more than Computerware's $29.95 when you can get top quality from real experts? Order the OS-9 Text Tools today!

CAT FGREP LOWER LS PACK PR
QSORT RPL SPLIT TAIL TIME TR
UNIO UNPACK UPPER UPS WC

New Ruler Crowned in Middle Kingdom - Ending Fierce Battles and Bloodshed

Sanctuary - Finally, a brave adventurer returned the three golden rings to the Sanctuary and was crowned ruler of the ***Middle Kingdom.*** This ends the gruesome carnage of warriors, merchants, and magicians that have been murdered and mamed by all varieties of monsters as they searched the dangerous Catacombs, Temple, and Pyramid for the precious rings. This Middle Kingdom ***adventure*** can be replayed in ***graphics*** for $24.95 on cassette or $27.95 on disk. Could you be crowned ruler? (Req. 32K)

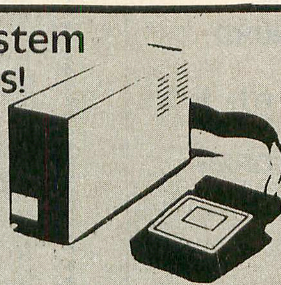
JDOS - Available Separately

Computerware announced they have a limited supply of JDOS (rom and manual) sets available for $39.95. JDOS is the new J & M disk operating system which supports double sided drives and has many other attractive features.

The Sourcerer Reveals All...

If you like to take things apart to see how they tick - if you want to see the hows and whys of assembly language programs - the ***Sourcerer*** is your tool! It's an easy-to-use, menu-driven ***disassembler*** that produces symbolic source code that can be assembled by most of the popular editor/assemblers. (Yes, OS-9 users, it will disassemble the mysterious OS-9!) It's available on cassette or disk; disk versions for RSDOS, FLEX, & OS-9. So anyone can take a closer look! At $39.95 on disk or $34.95 on tape, you owe it to your curiosity!

Disk System Specials!



Disk systems included top quality drives, J & M controller, cable, & manual. (Add $15 for RSDOS.)

Single drive, single-sided	$400
Single drive, double-sided	$435
Dual drives, single-sided	$595
Dual drive, double-sided	$650
Amdisk System	$595
Amdisk drives only	$475
J & M controller, w/JDOS	$135
J & M controller, w/RSDOS	$155
JDOS w/manual	$39.95

Bio Detector Results Not Admissable In Court

The truths and untruths have been exposed. The suspect's inner mind has been tapped through the "galvanic skin response" sensors of the ***Bio Detector.*** The reaction to every question was displayed with color and sound on the CoCo screen for everyone to see. Yet the culprit is freed on a technicality - Bio Detector results were not admissable in court. But at least the truth is out! You too can tap into the truth by hooking up your family, friends, and "others" to Computerware's ***Bio Detector*** and your CoCo. Just ask questions and watch the graphic screen. The truth will come out! (Just $29.95 for all hardware, software, and fun. Req. 16K)

Programmers Applaud New Basic Utilities and Print Spooler

A new aid to the serious Basic programmer released by Computerware has proven to be essential. It gives the 32K system a 2K print buffer and the 64K system a ***32K print buffer.*** WOW! Other utilites include a Basic ***cross reference program,*** a dump for values of all Basic program variables, a 51 x 24 screen display for 64K users and more. At $19.95 for cassette or $24.95 for disk, every programmer should have one!

Computerware® Disk System Breakthrough!

Buyers Worried About:

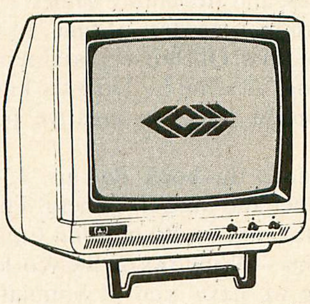
- buying pieces from several different vendors & having to assemble them together - if something's wrong, who do you go to?
- reliability!!
- getting the most advanced features like fast step rates, extended tracks, slim line size
- adequate power supply
- technical documentation

Computerware® Offers Solutions like:

- ***complete*** systems assembled & tested by ***expert technicians.*** We've been selling disk systems since ***1977*** so we know what you need & we make sure you get it!
- highest quality components including ***TEAC & Hitachi*** drives, ***J & M*** Systems controller, all ***GOLD*** connectors, ***heavy duty*** cabinet, power supply, & cable.
- totally adequate power supplies to insure reliability. We know dual drives need heavier power supplies!
- all TEAC & Hitachi drives with ***6 ms*** step rate, full ***40 tracks, slim*** line, & 1 year warranty.
- in addition to the DOS manual, a 20 page ***technical manual*** documenting every detail of disk drive performance & specification.

from Computerware®

CoCo Owners Use Video Plus to Interface Monitors



CoCo users can now take advantage of the crisp display of a ***composite video monitor*** by installing one of Computerware's ***Video Plus*** interfaces. They are inexpensive, completely assembled, and easy to install. It also provides audio output for monitors with audio. There are three models depending on the kind of monitor and whether you have the original CoCo or CoCo II.

Video Plus (original CoCo & either color or monochrome monitor)	$24.95
Video Plus IIM (CoCo II & monochrome monitor)	$26.95
Video Plus IIC (CoCo II & either color or monochrome monitor)	$39.95

New NAP Monitors Have Built-In Audio Speaker!

Computerware has made special arrangements with North American Phillips (familiar for Magnavox & Sylvania brands). Their green and amber composite video monitors are the only monochromes on the market with built-in audio. And they are still very affordable! Check out Computerware's full line of monitors.

NAP green	$109.95
NAP amber	$119.95
Color (Comrex or Amdek)	$265.00

Flexi Filer Price Slashed -Now Only $54.95!!!

Computerware's popular data base system now includes the powerful file manager, making ***Flexi Filer*** a super buy at the new reduced price. It comes with a useful personal inventory format as a starter and has been used for such applications as sales analysis, sophisticated mailing lists, property locator & descriptor, business inventory - the lists goes on! Flexi Filer can be tailored to meet almost any need and is now affordable to all. (Req. 32K & disk)

PASCAL Price Reduced!!!

Now anyone can explore the advanced language of Pascal with Computerware's affordable 32K subset of standard ***Pascal.*** Though it omits floating point and some sophisticated data structures, the user can enjoy learning the basics of this popular language and accomplish virtually any programming task. The cassette version ($39.95) includes compiler, P-code interpreter, supervisor, editor and sample programs. The disk version ($54.95) has added features like graphics, joystick, sound and directed I/O and includes compiler, P-code interpreter, supervisor and samples. The disk version with the Advanced Editor is available at $74.95. Finally, an **affordable Pascal!**

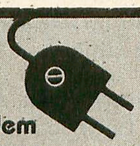
OS-9 Users Turn To Computerware®

OS-9 users are finding quality products at Computerware! The ***Advanced Editor*** is a much needed, comprehensive program editor. The ***Disk Fix & OS-9 Utilities*** package allows full use of drives like double sided, extended track, and fast step rates plus some very powerful and useful utilities. To explore how things "tick" the ***Sourcerer disassembler*** is a handy tool! ***Random Basic*** offers some significant advantages like extended precision and graphics. Computerware also carries Elite Word, O-Pak, and C-Compiler. Write for a complete ***catalog*** from the OS-9 experts!

Advanced Editor	$39.00
Disk Fix & Utilities	$29.95
Sourcerer	$39.95
Random Basic	$75.00
Elite Word	$72.95
O-PAK	$34.95
C-Compiler	$59.95

Synther 77 Users Form Band - Play Tunes Right From Their Keyboards

With ***Synther 77*** you can tune your keyboard to any of a hundred different voices (or instruments) then play music right on the keyboard. Some users groups have formed CoCo bands, playing familiar tunes together and saving their favorites to disk or tape. The pro musicians love the technical fine tuning factors like vibrato, bender, boing, attack, sustain, and decay. While the novices can enjoy just playing along and experimenting. ***Synther 77*** requires 32K and costs only $24.95 on cassette or $27.95 on disk. It will bring hours of listening and playing enjoyment to all.



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Okay, how about another contest? Send us answers to these four questions.

Q1) What magic word has a *Wordsworth #1* equal to the number of weeks in a year?
Q2) What five-letter word has the smallest *Wordsworth #2*?
Q3) What five-letter word has the largest *Wordsworth #2*?
Q4) What is the longest word (most letters) that has a *Wordsworth #2* less than 20,000?

We'll put all answers received by August 31, 1984, in a box, shake 'em up, and draw a winner. The winner will receive, of course, a stuffed dragon. If we get lots of answers, we'll draw for more stuffed dragons and perhaps some other prizes.

Simulations — Powerful Learning!

Schools use computers primarily to preserve old ways of teaching. So they use computers mostly as automated flashcards and for mundane drills and practice. These uses blend easily into traditional lesson plans. They can be done in one- to 10-minute chunks once or twice a day without disturbing 19th century teaching methods. No creative thinking is required on the part of the teacher. As always, the kids learn to memorize and regurgitate facts.

The most powerful computer tools for learning are Simulations, Simulation games, and Adventure games. Unfortunately, these take time, sometimes lots of time. In fact, an unpredictable amount of time. Of course, that doesn't fit in with the rigid scheduling of schools. Do you know any school that lets kids spend hours in creative problem-solving?

Earlier, we recommended the book *Parents, Kids, and Computers* by Lynne Alper and Meg Holmberg. This book is subtitled: *Learning Adventures Beyond the Classroom.* Chapter two, "Simulations — Windows on the World" is the best concise description we have seen of Simulations as learning tools.

> *"The most powerful computer tools for learning are Simulations, Simulation games, and Adventure games."*

We especially like text Adventure games. We can think of no better way to encourage a kid to learn several skills: reading, reasoning, learning by trial-and-error, map-making, problem-solving, and working together.

Wanted: Adventure games suitable for general audiences or okay with PG (parental guidance). We want games with these characteristics:

- Mostly non-violent. Focus on exploration, storytelling, and problem-solving instead of "kill monster, get treasure."
- Difficulty range from easy to moderately difficult. How about some easy games for beginners, parent and child?
- Reading level suitable for younger kids.
- Good documentation showing how to make maps and other ways of organizing information.
- Creative ways of imbedding things to learn in the game without sacrificing fun or playability.

We have received Adventure games from Prickly-Pear Software and Owls Nest Software. Look for their ads in this issue of THE RAINBOW. We are playtesting these games with parent and child playing together.

Help!

If your home has a kid, three to eight years old, and a CoCo, please share your experiences in using your CoCo with your child. If you write to us, please tell us if it is okay to print all or part of your letter in this column. ComputerKid, P.O. Box 310, Menlo Park, CA, 94026.

WANTED!

Young men and women seeking adventure, excitement and thrill-a-minute action. No experience necessary—just you and your Color Computer. See below:

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NEW!	WILLIE'S WAREHOUSE	29.95	29.95
NEW!	ICE HOCKEY	——	21.95
	ZAXXON	29.95	——
	PROTECTOR II	——	29.95
	DESERT PATROL	——	21.95
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	WACKY FOOD	——	19.95
	CASHMAN	——	24.95
	CHOPPER STRIKE	——	24.95
	TIME BANDIT	——	24.95

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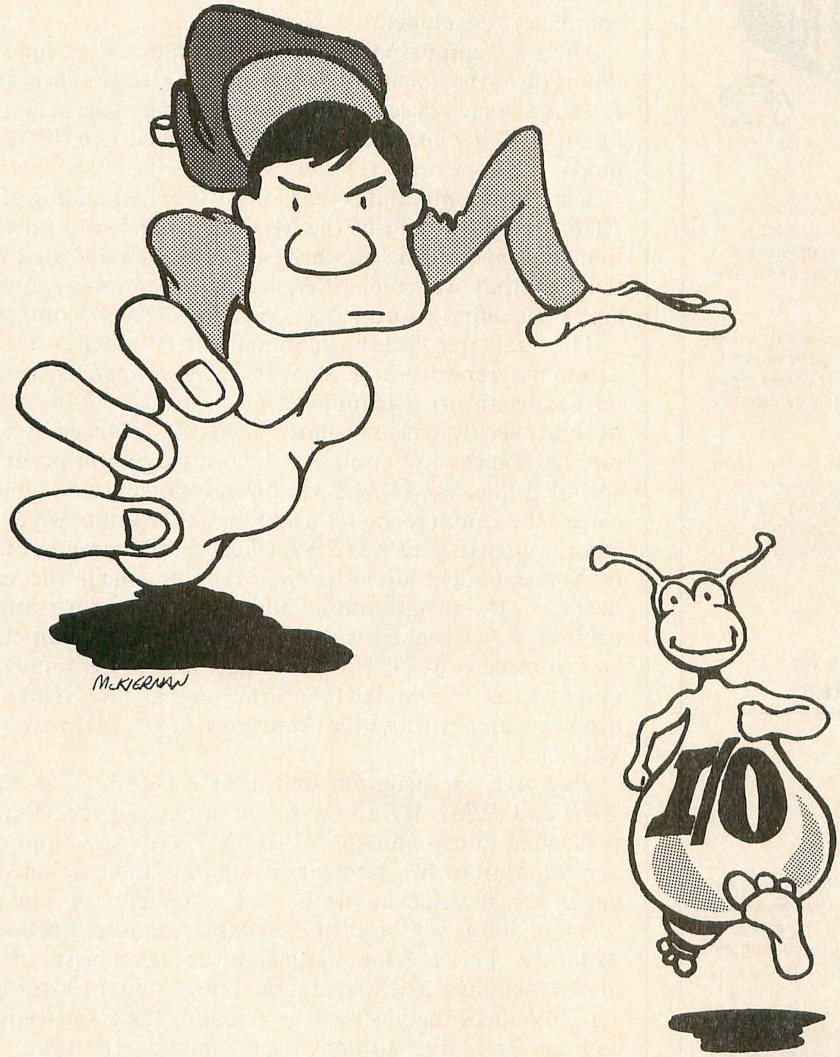

Trap That Error

By H. Allen Curtis

When the Color Computer is compared with the TRS-80 Model III by those who have used both, usually the Color Computer is favored. However, it is generally agreed that the Color Computer's keyboard and character set (no true lowercase) are inferior to the Model III's. Use of kits can eliminate the keyboard inferiority. Use of software can give the Color Computer a high resolution character set with a true lowercase. Sometimes the Color Computer is criticized because of its lack of BASIC commands for error trapping. The purpose of this article is to overcome this criticism.

The vehicle for overcoming the criticism is a program that adds to the Color Computer's repertoire of BASIC command analogs of the Model III's *ON ERROR GOTO, ERROR, ERL, ERR/2+1* and *RESUME* commands. Before the program called *Trapperr* is presented, a brief description of the new commands will be given. Then, after the presentation of *Trapperr*, there will follow a set of examples illustrating in detail the workings and applications of the new commands.

The *ETRAP* command is analogous to the Model III's *ON ERROR GOTO*. The format of *ETRAP* is simply as follows:

ETRAP line number

With *ETRAP* you provide a means of entry to an error-trapping routine which will permit your program to analyze an error when it occurs, take suitable action, and continue the program without any break in execution. The error-trapping routine starts at the line specified in the *ETRAP* command.

The next command, *ER#*, allows you to simulate a specified error. Its format is *ER# code* where code is any integer from one through 27 for Extended Color BASIC or from one through 38 for Disk BASIC. Associated with each code is a

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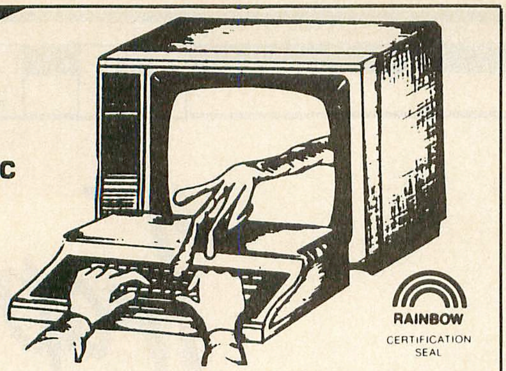
(H. Allen Curtis resides in Williamsburg, Va. He is interested in 17th and 18th century history and enjoys biking through the colonial capital. He balances past and present with his computer work.)



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distinct type of error. Table 1 shows the codes and their associated errors. Execution of the *ER#* command will cause the computer to react as though the associated error had occurred. This command is a handy tool in the composition and testing of error-trapping routines. The *ER#* command is not generally used in your program once it has been completely developed.

The *ERL* command of the Color Computer is a function that returns the line number in which an error has occurred. *ERL* is primarily used in an error-trapping made accessible by an *ETRAP* command. If an error occurs in the direct mode, *ERL* returns -1.

The *ERR* command is the Color Computer analog of the *ERR/2+1* command of the Model III. *ERR* is a function that returns the code number (see Table 1) associated with the error that occurred. *ERR*, like *ERL*, is primarily used in an error-trapping routine accessed by an *ETRAP* command.

The final error handling command to be added to BASIC's command repertoire is *RESUME. RESUME* is used to terminate an error-trapping routine by specifying where normal execution is to resume. *RESUME* followed by a line number causes the computer to resume execution at the specified line. *RESUME* without a following line number causes the computer to return to the statement in which the error occurred. *RESUME NEXT* causes the computer to go to the statement directly after that in which the error occurred. If a programming bug causes the error-trapping routine to be reached without the occurrence of an error, you will receive an ID Error message. The ID Error message in such a case is intended to inform you that a *RESUME* has been executed without the occurrence of any of the errors in Table 1.

Trapperr, the program that adds *ETRAP, ER#, ERL, ERR* and *RESUME* to the BASIC command repertoire of your computer is shown in Listing 1. *Trapperr* employs a combination of two languages — BASIC and machine language. Each value in the *DATA* statements of Lines 90 through 500 is a byte of the machine language portion of *Trapperr*. This machine language routine consists of two distinct sections. The first section, found in Lines 90 through 190, initializes the mechanism that adds the error-trapping commands to the computer's command repertoire. The second section, found in the rest of the *DATA* statements, acts as an extension of the BASIC ROM and executes each error-trapping command when issued.

The purpose of the BASIC portion of *Trapperr* is to generate the machine language routine, reserve and protect high RAM, and transfer the routine to the reserved memory area. Lines 10 and 20 take care of the reservation and protection of the high 336 bytes of RAM. Lines 30 through 60 generate and transfer the machine language routine to the protected RAM. Line 70 provides a check on the accuracy of your typing the *DATA* statement values. Line 80 causes the execution of the initialization section of the machine language routine. This section is no longer needed after its completion and return to BASIC. Therefore, its 90 bytes are released from protection. The addition of the five error-trapping commands comes at a memory cost of only 246 bytes. There is an additional cost for those *without* Disk BASIC; you may no longer employ the first three *USR* functions *USR0, USR1* and *USR2*.

After you have correctly keyed in *Trapperr*, run it; it takes about five seconds. Then save *Trapperr* on tape or disk.

Table 1

Code	Error	Description
1	NF	NEXT without FOR
2	SN	Syntax error
3	RG	RETURN without GOSUB
4	OD	Out of DATA
5	FC	Illegal function call
6	OV	Overflow
7	OM	Out of memory
8	UL	Undefined line
9	BS	Bad subscript
10	DD	Redimensioned array
11	/0	Division by zero
12	ID	Illegal direct
13	TM	Type mismatch
14	OS	Out of string space
15	LS	String too long
16	ST	String formula too complex
17	CN	Can't continue
18	FD	Bad file data
19	AO	File already open
20	DN	Device number error
21	IO	Input-Output error
22	FM	Bad file mode
23	NO	File not open
24	IE	Input past End of file
25	DS	Direct statement
26	UF	Undefined function
27	NE	Can't find file
28	BR	Bad Record Number
29	DF	Disk full
30	OB	Out of Buffer space
31	WP	Write Protected
32	FN	Bad filename
33	FS	Bad file structure
34	AE	File already exists
35	FO	Field Overflow
36	SE	Set to non-field string
37	VF	Verification
38	ER	Past End of Record

Erase *Trapperr* by typing and entering *NEW*. Now, you are ready to become more familiar with the error-trapping commands via illustrative examples.

Example 1: Type and enter the following:

```
10   ETRAP1000
900  STOP
1000 PRINT"TEST"
```

Then type *RUN* and press ENTER. The result is the message, BREAK IN 900. In Line 10 the entry Line 1000 is established for the error-trapping routine. Because no error occurred in Lines 10 and 900, the error-trapping routine was never reached.

Try typing and entering *RUN2000*. Ordinarily, you would receive a UL Error message, but because of the previous execution of the *ETRAP* command, the occurrence of the UL Error caused entry to the routine at Line 1000 and the subsequent printing of the word TEST on the screen.

Again, type and enter *RUN2000*. This time the message UL Error is indeed displayed. This illustrates that once an error has occurred, another *ETRAP* command must be issued in order to trap the next error.

Example 2: Add to the Example 1 program the following:

```
20   PRINT"THIS IS A ";:ER#16:STOP
```

Then change Line 1000 to:

```
1000 PRINT"TEST":RESUME
```

Displayed on the screen as a result of running this program is:

```
THIS IS A TEST
?ST ERROR IN 20
```

This display shows that after the completion of the *PRINT* statement of Line 20, the *ER#16* command simulated an ST Error that caused an interruption of the execution of Line 20 and an entry to the routine at 1000. At Line 1000 following the printing of TEST on the screen, the *RESUME* command brought about a return to the *ER#16* command in Line 20. Because there was no second execution of an *ETRAP, ER#16* this time produced the message, ?ST ERROR IN 20. Change Line 1000 to *1000 PRINT "TEST":RESUMENEXT* and then run the program again. Now, you should get printed on the screen the following:

```
THIS IS A TEST
BREAK IN 20
```

Because of the *RESUMENEXT* in Line 1000, the return was made to the *STOP* statement just after and *next* to the *ER#16* command. Thus, *ER#16* was only executed once in the changed version of the example program. The *STOP* in Line 20 accounted for the "BREAK IN 20" message.

Example 3: In the program of Example 2 change Line 1000 to:

```
1000 PRINT"TEST":PRINTERL:PRINTERR:
RESUMENEXT
```

Running this program yields the display:

```
THIS IS A TEST
20
16
BREAK IN 20
```

The execution of *PRINT ERL* and *PRINT ERR* in Line 1000 caused the printing of 20 and 16, respectively, before the execution of the *STOP* command in Line 20. The printed

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number 20 is the line in which the error occurred and 16 is the code number of the error.

Now, add the following line: *30 ER#5* and change Line 20 to *20 PRINT‘THIS IS A ”;:ER#16*. As you would now expect, running this program should produce the following display:

```
THIS IS A TEST
20
16
?FC ERROR IN 30
```

Change Line 1000 to:

```
1000 ETRAP1000:PRINT“TEST”:PRINTERL:
PRINTERR:RESUMENEXT
```

Running this program yields the following:

```
THIS IS A TEST
20
16
TEST
30
5
BREAK IN 900
```

The insertion of *ETRAP1000* in Line 1000 permitted the trapping of the error produced by the *ER#5* command in Line 30. The printing of 30 and 5 announced that the error occurred in Line 30 and was of the type having a code number 5.

Delete Line 900. Now the program has a bug: the error-trapping routine can be reached without the occurrence of an error. Run the program to get the following:

```
THIS IS A TEST
20
16
TEST
30
5
TEST
30
5
TEST
1000
12
```

The first half of the display is not surprising. The second printing of *TEST*, 30 and 5 is explained as follows: After the *ER#5* error at Line 30, the *RESUMENEXT* caused a return to the statement, immediately after *ER#5*, which happens to be the *ETRAP 1000* statement of Line 1000. The *ERL* and *ERR* values did not have a chance to change; hence, 30 and 5 were again printed after *TEST*. Because the error-trapping routine was reached illegally, an ID Error resulted. The occurrence of the ID error caused a legal entry to the error-trapping routine and thus the printing of 1000 and 12 after *TEST*. The error was at Line 1000 and was an error with code number 12. The final *RESUMENEXT* set up a return to the statement following the final statement of Line 1000. Since no line follows 1000, the program ended.

Example 4: Using *NEW*, erase the program of Example 3. Then key in the program of Listing 2. After you respond to the program's request to enter a message, the program forms a string consisting of a repetition of your message. The string formation continues until the program consumes all the string space allotted. Then the string is printed on the screen. This example illustrates the *ERL* function in an *IF . . . THEN* statement; it also demonstrates the use of a *RESUME* followed by a line number.

Example 5: Erase the program of Listing 2 and type the program of Listing 3. The *ER#s* in Lines 20 through 50 are included for illustrative and testing purposes only and would be deleted in an actual working program. Have you ever wished that the Color Computer provided more than abbreviated error messages? This example indicates how you can go about replacing the abbreviated error messages with descriptive ones.

Before the conclusion of this article, there is an important comment which should be made. *Trapperr* must be loaded and run before you load and run any program containing error-trapping commands. Furthermore, it is a good policy to load and run *Trapperr* before keying in any program using error-trapping commands. *Trapperr* must be present to permit the error-trapping commands to be tokenized. If you should start composing a program containing error-trapping commands without *Trapperr* residing in the computer, all is not lost. Merely save the program in ASCII format. When you wish to use that program, load and run *Trapperr* first; then the error-trapping commands will be automatically tokenized upon the loading of your program.

```
100....... 93
300...... 188
END ..... 61
```

Listing 1:

```
10 CLS:X=256*PEEK(116)-81
20 CLEAR100,X
30 X=256*PEEK(116)-80
40 FORZ=X TOX+335
50 READA$:A=VAL("&H"+A$):W=W+A
60 POKEZ,A:NEXT
70 IFW<>36869THENPRINT"DATA ERRO
R":STOP
80 EXEC X:CLEAR200,X+89
90 DATA CE,1,34,F6,1,92,C1,C2,26
100 DATA 17,30,8C,6C,86,E4,A7,81
110 DATA 86,E1,A7,8,86,52,A7,D
120 DATA 86,50,30,F,A7,4,33,4A
130 DATA 30,8C,2B,C6,B,BD,A5,9A
140 DATA E7,44,DC,74,33,56,A7,C1
150 DATA A7,C1,A7,41,A7,43,30,8C
160 DATA 34,C6,5,A7,81,5A,26,FB
170 DATA CE,1,8E,A7,41,86,7E,A7
180 DATA C4,86,7A,A7,42,39,3,3F
190 DATA 10,3F,28,2,3F,A,3F,37,0
200 DATA 45,52,CC,45,52,D2,45,52
210 DATA A3,45,54,52,41,D0,52,45
220 DATA 53,55,4D,C5,3F,45,3F,4D
230 DATA 3F,53,3F,5D,3F,A7,81,D1
240 DATA 25,3,7E,B2,77,30,8C,F0
250 DATA 80,CE,7E,AD,D4,C1,46,23
260 DATA 2,20,EF,C0,44,30,8C,DC
270 DATA 7E,B2,CE,30,8C,5B,EC,84
280 DATA 7E,B4,F4,30,8C,50,7E,B7
290 DATA 52,9D,A5,BD,AF,67,5A,58
300 DATA 7E,AC,46,DC,A6,34,6,BD
310 DATA AE,A4,33,8C,3E,AF,C4,35
320 DATA 6,DD,A6,9D,9F,27,4,81
330 DATA 3A,26,F8,C6,1,E7,59,39
340 DATA 34,12,30,8C,1F,A6,84,26
350 DATA 2,35,92,6F,80,A7,80,57
360 DATA 5C,E7,80,DC,A6,ED,81,DC
370 DATA 68,ED,81,EC,81,DD,A6,9E
380 DATA 21,32,1D,39,0,0,0,0,0,0
390 DATA 0,0,0,30,8C,F5,A6,84,27
400 DATA 46,6F,81,9D,A5,27,1A,81
410 DATA 3A,27,16,81,8B,27,3,7E
420 DATA AE,A6,8D,38,A6,C0,27,4
430 DATA 81,3A,26,F8,33,5F,DF,A6
440 DATA 39,8D,29,9E,19,30,2,EC
450 DATA 84,10,93,68,27,4,AE,1E
460 DATA 20,F3,30,2,9F,2B,11,93
470 DATA 2B,27,8,A6,C2,81,3A,26
480 DATA F5,20,DB,33,1B,20,D7,C6
490 DATA 16,7E,AC,46,EE,81,EC,84
500 DATA DD,68,39
```

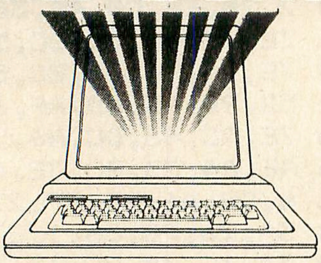
Listing 2:

```
5 CLEAR500
10 ETRAP1000
20 CLS:PRINT@259,"ENTER A MESSAG
E"
30 LINEINPUTA$
40 B$=" "+A$
50 IFI<101THENA$=A$+B$:I=I+1:GOT
050
60 PRINT@288,A$
900 STOP
1000 IFERL=50THENRESUME60ELSERES
UME
```

Listing 3:

```
10 ETRAP2000
20 ER#2
30 ER#3
40 ER#1
50 ER#10
900 STOP
1000 PRINT"NEXT without FOR":RET
URN
1010 PRINT"SYNTAX error":RETURN
1020 PRINT"RETURN without GOSUB"
:RETURN
2000 ON ERR GOSUB1000,1010,1020
2010 IFERR>3THENRESUMEELSEETRAP2
000:RESUMENEXT
```

SUPER SCREEN



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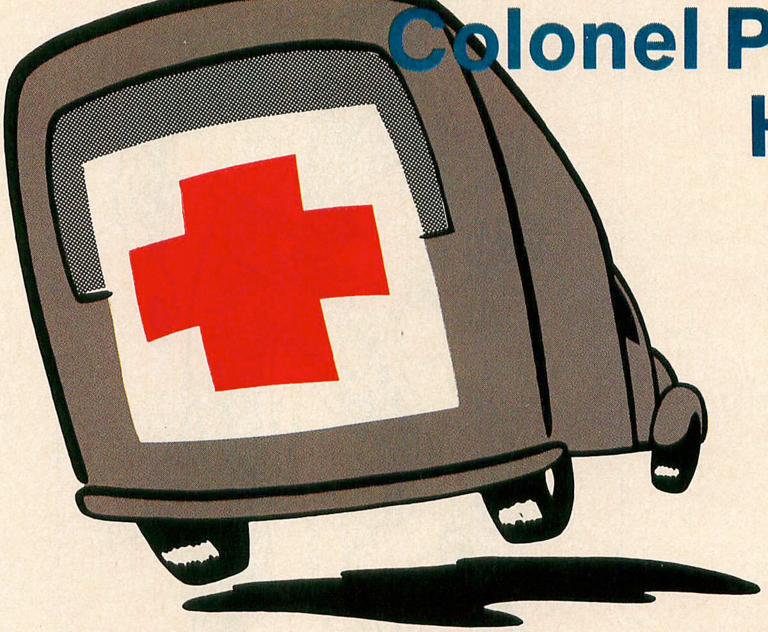

By Milt Tanzer

For several years (I won't say how many because that is one of the questions) the TV series *M*A*S*H* stayed at the top of the charts as one of the most watched programs on TV. It even topped the Super Bowl game on viewing audience.

One evening, after the series had ended, our family sat reminiscing about the program. "Remember how Hawkeye and B.J. used to pick on Frank Burns?" someone said. "Sure, it started with the pilot episode when they put him in a full body cast," someone else answered. "That wasn't B.J. He wasn't on the show yet. That was Hawkeye and Trapper." Before we knew it, we were totally involved in testing each other's memory about the many characters and happenings at the M*A*S*H unit. Over the next few months we made a list of 200 trivia questions and answers about the series, spanning the entire 11 years the show ran. (Oh, I just gave you one answer.)

I decided to write a program for the CoCo that would give all *M*A*S*H* fans the opportunity to share the fond memories of everyone's favorite TV series.

Since I could not find a way to have the computer accept a correct answer that varies slightly from the data line answer, I suggested to the player in the instructions not to take a missed question too seriously . . . after all, it's only a game.

The listing which follows is the 16K version of the game and can be found on this month's RAINBOW ON TAPE. Additionally, a longer (32K) version with many more *M*A*S*H* trivia questions is also on RAINBOW ON TAPE.

(Milt Tanzer, a commercial/investment realtor and author of three books on real estate investing, uses his CoCo primarily for word processing book manuscripts. This is his first venture into game programming.)

135	152
245	2
370	47
465	84
540	70
END	43

The listing:

```
1 'BY MILT TANZER
2 ' 2921 NE 46TH ST.
3 ' LIGHTHOUSE POINT, FLA. 33064
5 CLEAR 1000
10 CLS:PMODE 3,1
15 PCLS:SCREEN1,1
20 DRAW"C3;BM44,156;D18;R12;U18"
25 CIRCLE(38,168),10,4,1,.25,.85
30 CIRCLE(32,164),16,4,1,.12,.90
35 LINE(44,156)-(120,156),PSET
40 LINE(56,171)-(120,160),PSET
45 DRAW"BM48,137;D18;R3;U18;L3"
50 DRAW"BM1,140;R100;U1;L100"
55 DRAW"BM12,182;F4;R60
60 CIRCLE(122,158),9,4
65 DRAW"BM37,184;E9;R8;F9
70 DRAW"BM56,171;E14;F10;E10;F7;
E7;F5;E5"
75 DRAW"BM20,181;F2;R52"
80 PAINT(47,165),3,3
85 FORT=1TO1000:NEXT
90 DRAW "BM16,10;D40;R8;U28;F12;
E12;D28;R8;U40;L8;G12;H12;L8"
95 PLAY"D;L7;C;L4;D;C;D;C;P4"
100 LINE(92,52)-(76,92),PSET
```

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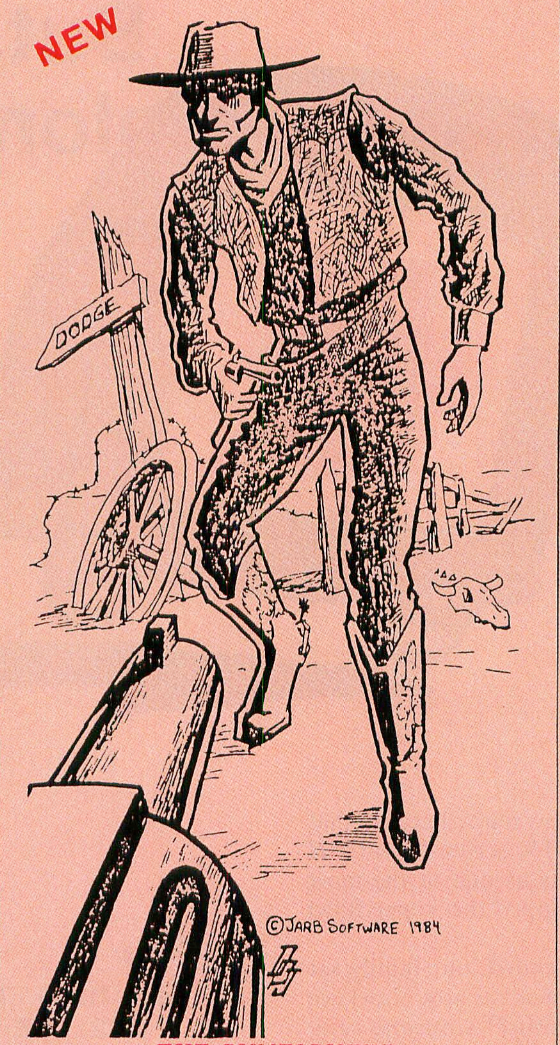
NOT FOR CoCo 2



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```
105 LINE(76,92)-(84,92),PSET
110 LINE(84,92)-(88,84),PSET
115 LINE(88,84)-(104,84),PSET
120 LINE(104,84)-(108,92),PSET
125 LINE(108,92)-(116,92),PSET
130 LINE(116,92)-(100,52),PSET
135 LINE(100,52)-(92,52),PSET
140 LINE(96,64)-(88,76),PSET
145 LINE(88,76)-(104,76),PSET
150 LINE(104,76)-(96,64),PSET
155 PLAY"L6;C;L4;D;L6;C;L4;D;C;D
;C;P4"
160 DRAW"BM144,96;G8;D8;F8;R26;D
8;L32;F8;R24;E8;U8;H8;L24;U8;R32
;H8;L24"
165 PLAY"L4;C;O2;A;L4;O3;C;D;F"
170 DRAW"BM196,140;D40;R8;U16;R2
4;D16;R8;U40;L8;D16;L24;U16;L8"
175 PLAY"L4;GFDC;L2;D"
180 PAINT(20,12),4,3:PAINT(96,54
),4,3
185 PAINT(148,98),4,3:PAINT(200,
144),4,3:FOR X=1TO500:NEXT
190 COLOR4,3
195 LINE(64,52)-(76,64),PSET
200 LINE(76,52)-(64,64),PSET
205 LINE(64,58)-(76,58),PSET:FOR
X=1TO500:NEXT
210 LINE(120,88)-(132,100),PSET
215 LINE(132,88)-(120,100),PSET
220 LINE(120,94)-(132,94),PSET:F
OR X=1TO500:NEXT
225 LINE(180,132)-(192,144),PSET
230 LINE(192,132)-(180,144),PSET
235 LINE(180,138)-(192,138),PSET
:FORX=1TO500:NEXT
240 PLAY"L4;C;O2;A;O3;CDFGFDC;L1
;D"
245 DRAW"BM180,16;D16;L16;D20;R1
6;D16;R20;U16;R16;U20;L16;U16;L2
0"
250 PAINT(188,24),4,4
255 FOR T=1TO1000:NEXT
260 PRINT@71,"WELCOME TO..."
265 PRINT@138, "M*A*S*H"
270 PRINT@202, "TRIVIA"
275 PRINT@385,"DO YOU WANT INSTR
UCTIONS?(Y/N)":INPUT I$
280 IF I$="Y" THEN GOTO450
285 CLS:PRINT@165,"PLEASE BE PAT
IENT"
290 PRINT@322,"I'M THINKING UP Q
UESTIONS"
295 PLAY"D;L6;C;L4;D;C;D;C;P4"
300 DIM Q$(20),A$(20)
305 FORX=1TO20
310 READ Q$(X),A$(X)
315 NEXTX
320 CLS:C=0
325 FOR Y=1TO20
330 CLS:PRINT@64," * * * * * * *
 * * * * * * * *"
335 PRINTQ$(Y):INPUT Z$
340 IFZ$=A$(Y) THEN GOTO375
345 SOUND100,10
350 IF Z$<>A$(Y) THEN PRINT@266,
"MY ANSWER IS:  "
355 PRINT@320,A$(Y)
360 FOR T=1TO2500:NEXT
365 NEXTY
370 GOTO415
375 R=RND(5):PRINT""
380 FORX=1TO5:SOUND50,1:SOUND150
,1:NEXT
385 IFR=1 THEN PRINT"THAT'S RIGH
T..YOU'RE PRETTY GOOD"
390 IFR=2 THEN PRINT"HEY,YOU'RE
OK"
395 IF R=3 THEN PRINT"TERRIFIC..
.RIGHT AGAIN"
400 IFR=4 THENPRINT"YOU DID IT A
GAIN
405 IFR=5 THENPRINT"RIGHT...YOU
SURE KNOW MASH"
410 C=C+1:FOR T=1TO1500:NEXT:GOT
O365
```

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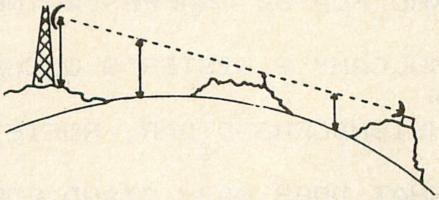

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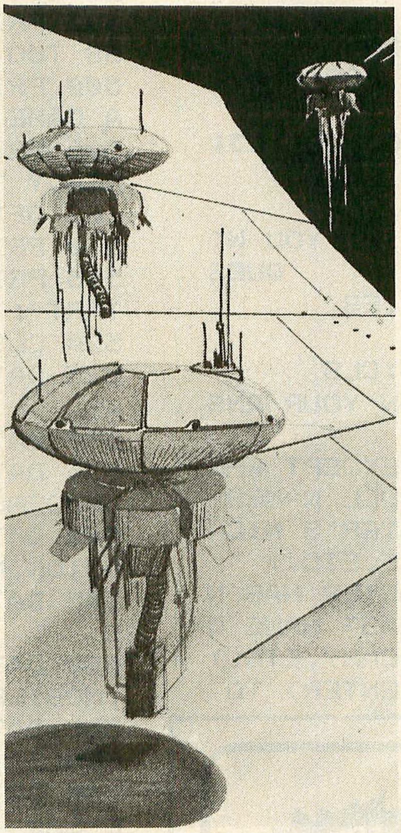

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7890ABCD
NOPQRSTU
efghijklmnop
wxyz.,!?-;:'"()

Requires a Bit Mode Printer. Works with Epson, Okidata, Gemini 10X, R.S. Line Printer VII, DMP 100 or equivalent.

Old English
90ABCDE
NOPQRS
abcdefghijkl

36 point (1/2 inch) letters are variably spaced — great for flyers, invitations, signs, etc. Input up to 17 lines of text at a time; save and retrieve data.

Cartoon
7890ABCDEF
RSTUVWXYZa

```
415 CLS:PRINT:PRINT"THAT'S 20 QU
ESTIONS"
420 PLAY"D;L6;C;L4;DCDC;P4"
425 PRINT:PRINT"YOU GOT ";C;"RIG
HT OUT OF 25"
430 RESTORE:PRINT"CARE TO TRY MO
RE?(Y/N)":INPUT C$
435 IFC$="Y"THEN GOTO320
440 PRINT:PRINT"THANKS FOR PLAYI
NG."
445 PLAY"L4;C;O2;A;L4;O3;CDF;L3;
GFDC;L2;D":END
450 'INSTRUCTIONS
455 CLS:PRINT:PRINT:PRINT"YOU WI
LL BE ASKED 20 TRIVIA       QUES
TIONS ABOUT THE TV SERIES
     M*A*S*H
460 FOR T=1TO2500:NEXT:CLS
465 PRINT:PRINT"TYPE IN YOUR ANS
WER AND <ENTER>"
470 PRINT:PRINT"HINT: EXCEPT WHE
RE ASKED TO     GIVE FULL NAMES
USE ONLY THE    CHARACTER'S NICK
NAME (RADAR,    HAWKEYE,ETC.)
475 PRINT"IF THE CHARACTER HAS N
O NICKNAME USE THEIR LAST NAME O
NLY          (POTTER,MULCAHY,ETC.)
480 PRINT@418,"PRESS <ENTER> TO
CONTINUE":INPUT C
485 CLS
490 PRINT"AT TIMES, THE COMPUTER
 MAY TELL YOU YOUR ANSWER IS NOT
 CORRECT  JUST BECAUSE YOUR WORD
ED IT     DIFFERENTLY.
495 PRINT"PLEASE DON'T TAKE A MI
SS TOO    SERIOUSLY":PRINT
500 PRINT"AFTER ALL...IT'S ONLY
A GAME!!"
505 PRINT:PRINT"...SO IF YOU'RE
READY TO RELIVE       YOUR MEMOR
IES OF"
510 PRINT@362,"M*A*S*H
515 PRINT@418,"PRESS<ENTER> TO S
TART":INPUT C
520 CLS:GOTO285
525 DATA H.Q.PHONE OPERATOR,SPAR
KY
530 DATA POTTER'S HOBBY,PAINTING
535 DATAWHO PLAYED TRAPPER,WAYNE
 ROGERS
540 DATAMULCAHY'S SISTER'S OCCUP
ATION,NUN
545 DATANEIGHBORHOOD BAR, ROSIE'
S
550 DATAWHAT DOES MASH STAND FOR
,MOBILE ARMY SURGICAL HOSPITAL
555 DATANAME AND RANK OF INTELLI
GENCE   OFFICER,COLONEL FLAGG
560 DATAWHO QUIT DRINKING WHEN H
E SAW   HIS BAR BILL,HAWKEYE
565 DATARADAR'S GUINEA PIG,DAISY
570 DATAONLY ACTOR TO STAR BOTH
IN THE  TV SERIES AND THE MOVIE,
GARY BURGHOFF
575 DATANAME AND RANK OF THE SHR
INK,MAJOR SIDNEY FREEDMAN
580 DATAPOTTER'S HOMETOWN AND ST
ATE,"HANNIBAL,MISSOURI"
585 DATAWHAT DID B.J. DO THAT BU
GGED    HAWKEYE,COMBED HIS MUSTA
CHE
590 DATABURNS' FAVORITE DRINK,SH
IRLEY TEMPLE
595 DATANAME AND RANK OF NURSE W
HO WAS  PRIZE IN A RAFFLE,LT. DI
SH
600 DATAWHO KEPT BOMBING THE MAS
H UNIT,FIVE O'CLOCK CHARLIE
605 DATAHOW DID BURNS PASS HIS M
EDICAL  EXAMS,BOUGHT THE ANSWERS
610 DATAKLINGER'S FAVORITE TEAM,
TOLEDO MUD HENS
615 DATAWHERE DID BLAKE'S PLANE
CRASH,SEA OF JAPAN
620 DATANAME OF BARBECUE RIB PLA
CE IN   CHICAGO, ADAM'S RIB
```

The

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RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings you will find in *the Rainbow* are formatted for a 32-character screen — so they will show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on listings indicates that program is available through our *Rainbow On Tape* service. An order form for this service is on the insert card bound in the magazine.

RAINBOW
CERTIFICATION
SEAL

The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to *the Rainbow* for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in *the Rainbow* and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Using Machine Language

Machine Language programs are one of the features of *the Rainbow*. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from *the Rainbow's* listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00.

What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout *the Rainbow*.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangable.

Rainbow Check PLUS

The small boxes that you see accompanying programs in the *Rainbow* "Check system," which is designed to help you type in programs accurately.

Rainbow Check PLUS will count the number and values of characters you type in. You can then compare the numbers you get to those printed in *the Rainbow*. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

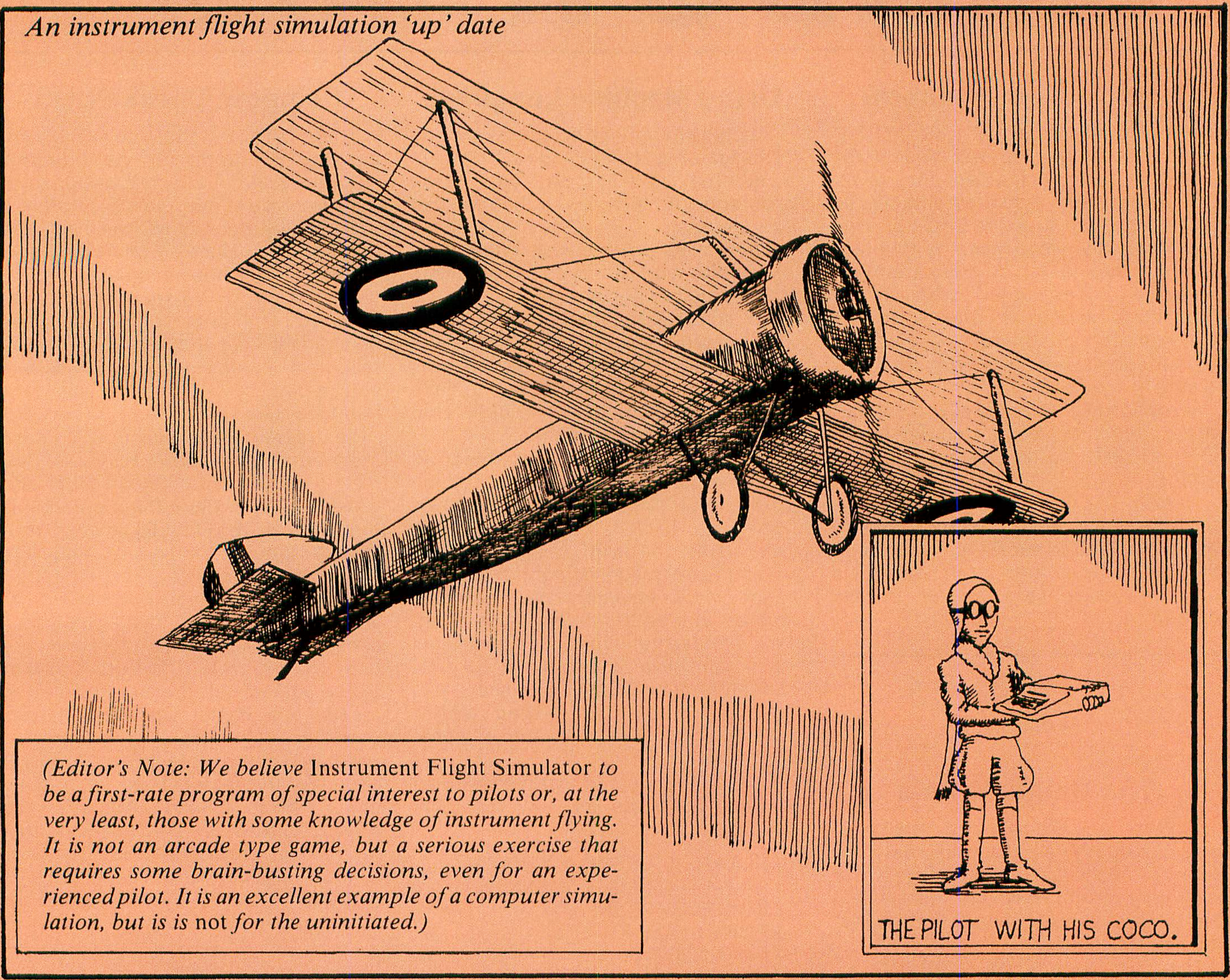
To use *Rainbow Check PLUS*, type in the program and *CSAVE* it for later use, then type in the command *RUN* and press [ENTER]. Once the program has run, type *NEW* [ENTER] to remove it from the area where the program you're typing in will go.

Now, whenever you press the down arrow key, your CoCo will give you a checksum based on the length and content of the program in memory. This is to check against the numbers printed in *the Rainbow*. If your number is different, check the listing carefully to be sure that you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on page 21 of the February 1984 *Rainbow*.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR25,X-1
30 X=256*PEEK(35)+178
40 FOR Z=X TOX+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182,1,106,167,140,60,134
100 DATA 126,183,1,106,190,1,107
110 DATA 175,140,50,48,140,4,191
120 DATA 1,107,57,129,10,38,38
130 DATA 52,22,79,158,25,230,129
140 DATA 39, 12, 171,128,171,128
150 DATA 230,132,38,250,48,1,32
160 DATA 240,183,2,222,48,140,14
170 DATA 159,166,166,132,28,254
180 DATA 189,173,198,53,22,126,0
190 DATA 0,135,255,134,40,55
200 DATA 51,52,41,0
```

An instrument flight simulation 'up' date


THE PILOT WITH HIS COCO.

(Editor's Note: We believe Instrument Flight Simulator *to be a first-rate program of special interest to pilots or, at the very least, those with some knowledge of instrument flying. It is not an arcade type game, but a serious exercise that requires some brain-busting decisions, even for an experienced pilot. It is an excellent example of a computer simulation, but is is not for the uninitiated.)*

'SOPWITH COCO' FLIES AGAIN!

By William G. Franklin

For all you Sopwith flyers who have stuck with it, we are going to clean up a little and then really get serious about navigational aids.

If you had trouble in Line 170 of the *Instrument Flight Simulator* in the June 1983 issue, check the data statements carefully in the 7000 series lines to see that you have not inserted a semicolon in place of a comma. These are *DRAW* strings and the letters must be correct or you will get a Function Call Error when the program attempts to draw the character in error. Disk system users please note that the variable *AS* in Lines 390, 400, 405, 410, 1190, 1510, and 8030 should be changed to some other designation, i.e., AV or VQ. Finally, if you remove the semicolons altogether in the 7000 series data statements you should be able to run the 16K version without having to *CLEAR 100* prior to running.

This update will: allow 26 stations to be input; install a course deviation indicator (CDI) feature coupling the path deviation indicator to TACAN and ADF stations; require a field elevation input when entering ILS location data (this means you will no longer be landing at 0 on the altimeter, but at the barometric altitude, or field elevation, you set in). It will also give you some instrument labels if you wish, and clean up some of the techniques.

The increase to 26 stations now uses the alphabet to identify the stations: A through F for ILS, G through P for TACAN, and Q through Z for ADF. A significant difference is that when entering station data, the letter identifying the station need only be pressed. The rest of the information must still be entered. However, if you make a mistake, the information still may be re-entered the next time as only the last data entered for a particular station is valid. You will also be entering a field elevation — more on this later.

The CDI feature includes a read out in the window just above the DME window, a dot indication on the outside of the D/F dial, and an indication by the path deviation pointer if you are within ±15° of the selected course.

Course selection is made with the '1', '2', and '3' keys. The '1' key increments the hundreds digit, the '2' key increments the tens digit, and the '3' key increments the ones digit. Values above 360° are not allowed. For example, if the current course selected is 276° and the hundreds digit is incremented, the tens digit will reset to 0. This should not present any difficulty so long as the operation is understood. As a new course is selected, the dot on the outside of the D/F dial will be placed accordingly, representing the course selected.

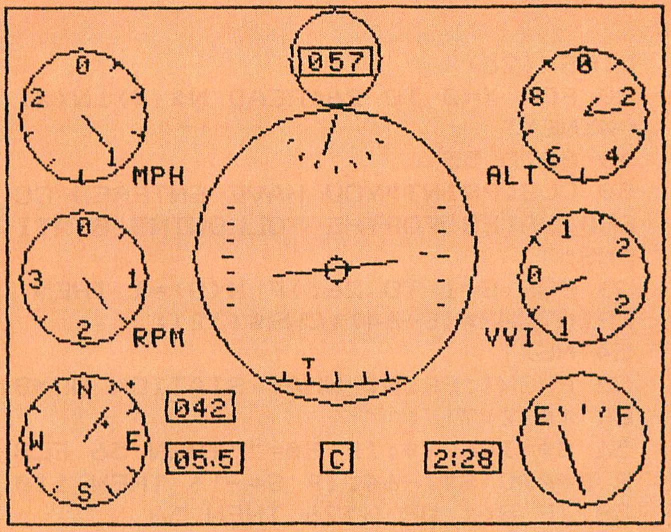
If you are *inbound* to a station and want to fly a particular radial, the course selected must be the reciprocal, 180° opposite, of the radial you wish to fly. Example 1: You are flying inbound on the 44° radial, the selected course should be 224°. Example 2: You are inbound on 286° radial, the course selected should be 106°. If you are outbound, the selected course should be that of the radial. Example: You are flying away from a station on the 318° radial, select course 318. In all of these cases the path deviation pointer will indicate where the correct path is and you must fly toward that path — operation of this indicator is the same as in the ILS mode. As a course deviation indicator the calibration is 5° per division up to ±15°. Greater than 15° deviation from the selected course disconnects the CDI and removes the pointer.

The CDI indicates the selected path, left or right of your airplane, regardless of the aircraft heading. Therefore, it is important that you understand the inbound/outbound and course select relationship so that you can properly interpret the CDI movement when flying *across* a radial and using that station to cross check your position.

When an ILS station, for which you have input a position, is selected, the runway heading will be displayed in the course set window and the indicator on the D/F dial will be set accordingly. Course select can not be changed while an ILS station is selected.

The field elevation feature allows you to insert a 0 to 2000 foot field elevation and, when landing, the ILS glideslope will indicate properly so that you will touch down with an altimeter reading of the field elevation. If you are not using an ILS, the terrain elevation reverts to 0. *Important:* If you enter an ILS airspace at below the field elevation, then punch up the ILS station, the program will pause with a reminder of your error. You may continue by pressing ENTER. The ILS station will be turned off and you should climb to above the field elevation before reselecting that station. The "aircraft elevation" input allows you to place the airplane "on the field" at the beginning. However, as soon as you are airborne and select a valid nav-aids station, terrain elevation reverts to 0 or to that input for an ILS if you are in range.

(Bill Franklin has worked in communications and electronics for over 26 years. He is currently a flight simulator technician at Little Rock Air Force Base.)



The three features just described *should enable* you to use the FAA low-level charts and let-down plates to realistically simulate instrument flying techniques. These charts are available at FAA flight stations. Correspondence I have received from pilots has been enthusiastic about the Sopwith CoCo and these improvements are the ones most frequently requested.

Finally, the change in step 5670 puts the turn rate indicators close to the four minute and two minute turn rates, and Line 5810 will label the top two instruments on each side. More efficient methods are used in Lines 50, 60, and 1835; some interesting input techniques in Lines 56 and 1610-1625; and the course set control in lines 1660-1700.

If you do not wish to key in the program yourself, you may send $7 to William G. Franklin, 31 Preston Ct., Jacksonville, AR 72076 for a tape of the complete updated Sopwith CoCo. Likewise, if anyone wants the original version for 16K, the same offer applies and please specify you want the 16K version.

72	207	2039	203
145	190	3005	18
380	73	5300	169
560	192	5540	126
1510	23	5810	26
1685	245	7010	101
1830	154	END	224

The listing:

```
1 PRINT"COPYRIGHT WILLIAM G. FRA
NKLIN 1983"
2 'SIM 16A1  JUL 1983
20 DIMN$(26):DIMN(26):DIMSX(26):
```

```
DIMSY(26)
30 FOR X=0 TO 26:READ N$(X):N(X)
=0:NEXT
40 GOTO 55
50 CLS:PRINT"YOU HAVE ENTERED CO
ORDINATES FORTHE FOLLOWING STATI
ONS:"
53 FOR S=1 TO 26:IF N(S)=1 THEN
PRINTCHR$(S+64);CHR$(32);
54 NEXT
55 PRINT:PRINT"WHAT STATION NUMB
ER (A-Z)? ";
56 S$=INKEY$:IF S$=""THEN 56 ELS
E S=ASC(S$)-64:IF S=-16 THEN 110
58 IF S<1 OR S>26 THEN 56
59 PRINTS$
60 IF S>16 THEN 90 ELSE IF S>6 T
HEN 80
70 PRINT:PRINT"STATION ";CHR$(S+
64);" IS AN ILS":INPUT"STATION B
EARING (0-360)";A:A=A/57.29:INPU
T"STATION DISTANCE (MILES)";D:D=
D*5280:SX(S)=D*COS(A):SY(S)=D*SI
N(A):INPUT"RUNWAY HEADING (0-360
)";X:RB(S)=INT(X)/57.29:N(S)=1
72 INPUT"FIELD ELEV. (0-2000 FEE
T)";X:IF X<0 OR X>2000 THEN 72 E
LSE FE(S)=X
74 GOTO 50
80 PRINT:PRINT"STATION ";CHR$(S+
64);" IS A TACAN":GOTO 100
90 PRINT:PRINT"STATION ";CHR$(S+
64);" IS AN ADF"
100 INPUT"STATION BEARING (0-360
)";A:A=A/57.29:INPUT"STATION DIS
TANCE (MILES)";D:D=D*5280:SX(S)=
D*COS(A):SY(S)=D*SIN(A):N(S)=1:G
OTO 50
110 CLS:PRINT:INPUT"AIRCRAFT BEA
RING (0-360)";A:A=A/57.29:INPUT"
AIRCRAFT DISTANCE (MILES)";D:D=D
*5280:TX=D*COS(A):TY=D*SIN(A):IN
PUT"AIRCRAFT HEADING (0-360)";X:
CS=INT(X)
112 INPUT"AIRCRAFT ELEV.(0-2000
FT)";X:IF X<0 OR X>2000 THEN 112
 ELSE AL=X
120 PRINT:INPUT"GALLONS OF FUEL
(MAX 24,USES 6  GPH @ 2000 RPM)"
;X:IF X>24 THEN FR=12 ELSE IF X<
0 THEN FR=-12 ELSE FR=X-12
130 PRINT:INPUT"WIND DIRECTION (
0-360)";X:WA=INT(X)+180:INPUT"WI
ND VELOCITY (MPH)";X:WS=INT(X)
135 CLS:PRINT:PRINT
140 Z=JOYSTK(0):X=JOYSTK(1):IF X
<63 THEN PRINT@64,"PLEASE PULL T
HROTTLE BACK":GOTO 140
145 CLS
150 PRINT:PRINT:PRINT"PLEASE STA
ND BY. AIRCRAFT IS    BEING SERV
ICED."
170 S=0:DIMA$(10):FOR X=0 TO 10:
READ A$(X):NEXT X
210 PMODE4,1:PCLS0:GOSUB5000
290 RX=30:RY=100:AX=30:AY=40:VX=
224:VY=100:L1=224:L2=40:LX=224:L
Y=40:FX=224:FY=180:SX=30:SY=160:
IX=128:IY=40
300 Q7=1:Q6=1:Q5=1:Q8=.01:H=0:AZ
=AL:C7=9:G6=9:C5=9:LR=40:P1=1:TI
MER=0
320 H=TIMER:TIMER=0:TH=TH+H
330 Z=JOYSTK(0):R=63-JOYSTK(1):B
=JOYSTK(2)-31:EP=(JOYSTK(3)-31)/
188
340 IF B<>B1 OR EP<>PE THEN GOSU
B 8000
360 IF AL>AZ OR R>12 THEN R=1260
+R*20 ELSE R=R*116
365 IF FR=-12 AND AL>AZ THEN R=7
00 ELSE IF FR=-12 AND AL=AZ THEN
 R=0
367 IF R1<30 THEN R1=0
370 R=R1+((R-R1)*.6):R1=R:X=30+(
SIN(R/636.6)*15):Y=100-(COS(R/63
6.6)*15):LINE(30,100)-(RX,RY),PR
ESET:LINE(30,100)-(X,Y),PSET:RX=
X:RY=Y
380 AP=(SIN(6*((R-2000)/4488)+.5
7)-.54)/6
390 AS=(R*(1-AP)*(1-EP))/16.66:A
S=A1+((AS-A1)*.1):IF AS<10 THEN
AS=0
400 X=30+(SIN(AS/39.46)*15):Y=40
-(COS(AS/39.46)*15):LINE(30,40)-
(AX,AY),PRESET:LINE(30,40)-(X,Y)
,PSET:AX=X:AY=Y:A1=AS
405 IF AS<50 THEN EP=-1
410 IF SGN(VV)=-1 THEN VV=((AP+E
P)*AS)/15 ELSE VV=(1-AL/10000)*(
(AP+EP)*AS)/15
420 IF AL=AZ AND SGN(VV)=-1 THEN
 VV=0
430 V1=V5+((VV-V5)*.3):X=224-(CO
S(V1)*15):Y=100-(SIN(V1)*15):LIN
E(224,100)-(VX,VY),PRESET:LINE(2
24,100)-(X,Y),PSET:VX=X:VY=Y:V5=
V1
440 Z=JOYSTK(0):B=JOYSTK(2)-31:E
P=(JOYSTK(3)-31)/188:P=INT(100*(
EP+(SIN(6*AP-.57)+.54)/6)):IF B<
```

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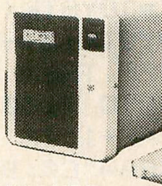

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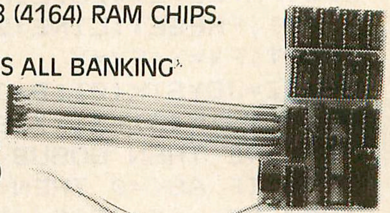

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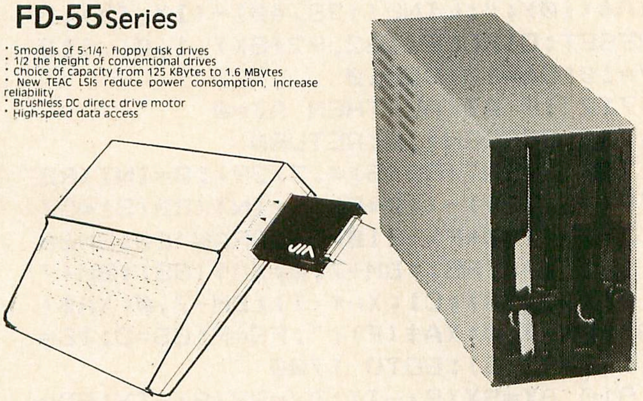

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```
>B1 OR EP<>PE OR P<>P1 OR AS<40
THEN GOSUB 8000
450 AL=AL+(VV*H)/4.6:IF AL<=0 TH
EN AL=0 ELSE IF AL<=AZ THEN AL=A
Z
460 X=224+(SIN(AL/159)*15):Y=40-
(COS(AL/159)*15):LINE(224,40)-(L
X,LY),PRESET:LINE(224,40)-(X,Y),
PSET:LX=X:LY=Y
470 X=224+(SIN(AL/1592)*8):Y=40-
(COS(AL/1592)*8):LINE(224,40)-(L
1,L2),PRESET:LINE(224,40)-(X,Y),
PSET:L1=X:L2=Y
560 FR=FR-((R*H)/72000000):IF FR
=<-12 THEN FR=-12
570 X=224+SIN(FR/25.2)*26:Y=180-
COS(FR/25.2)*26:LINE(224,180)-(F
X,FY),PRESET:LINE(224,180)-(X,Y)
,PSET:FX=X:FY=Y
580 Z=JOYSTK(0):B=JOYSTK(2)-31:E
P=(JOYSTK(3)-31)/188:IF B<>B1 OR
 EP<>PE THEN GOSUB 8000
1190 IF AS<=0 THEN 1310
1200 BC=-10*(COS((B/31)+1.570796
3)):CS=CS+BC:IF CS>360 THEN CS=C
S-360 ELSE IF CS<=0 THEN CS=CS+3
60
1310 C=INT(CS+.5):IF C=C1 THEN 1
350 ELSE C2=INT(C/100):C3=INT(C/
10)-(10*C2):C4=C-(100*C2)-(10*C3
):C1=C:DRAW"C0;BM134,23;XA$(C7);
C1;XA$(C4);":C7=C4
1320 IF C3=C6 THEN 1350 ELSE DRA
W"C0;BM126,23;XA$(C6);C1;XA$(C3)
;":C6=C3
1330 IF C2=C5 THEN 1350 ELSE DRA
W"C0;BM118,23;XA$(C5);C1;XA$(C2)
;":C5=C2
1350 X=30+SIN(C/57.2)*10:Y=160-C
OS(C/57.2)*10:CIRCLE(CX,CY),1,0:
CIRCLE(X,Y),1,1:CX=X:CY=Y
1360 Z=JOYSTK(0):B=JOYSTK(2)-31:
EP=(JOYSTK(3)-31)/188:IF B<>B1 O
R EP<>PE THEN GOSUB 8000
1510 IF AS=0 THEN 1610 ELSE CD=(
AS*5.28*H)/216:A=CS/57.29:X=CD*C
OS(A):Y=CD*SIN(A):TX=TX+X:TY=TY+
Y
1520 IF AL=AZ OR WS=0 THEN 1610
ELSE WD=(WS*5.28*H)/216:A=WA/57.
29:X=WD*COS(A):Y=WD*SIN(A):TX=TX
+X:TY=TY+Y
1610 S$=INKEY$:IF S$="" THEN 164
0
1615 X=VAL(S$):IF X>0 AND X<4 AN
D S>6 OR S<1 THEN ON X GOSUB 166
0,1670,1680
1620 X=ASC(S$)-64:IF X=-16 THEN
X=0
1625 IF X<0 OR X>26 THEN 1640 EL
SE GOSUB 1710
1630 DRAW"C0;BM126,170;XN$(S);C1
;XN$(X);":S=X:GOSUB 1710
1635 IF S<7 AND N(S)=1 GOSUB 174
0
1640 IF S=0 OR N(S)=0 THEN GOSUB
 1710 ELSE GOSUB 1810
1645 Z=JOYSTK(0):B=JOYSTK(2)-31:
EP=(JOYSTK(3)-31)/188:IF B<>B1 O
R EP<>PE THEN GOSUB 8000
1650 GOTO 2100
1660 F=F+1:IF F>3 THEN F=0
1665 DRAW"C0;BM66,151;XA$(FS);C1
;XA$(F);":FS=F:GOTO 1690
1670 G=G+1:IF G>9 THEN G=0
1675 DRAW"C0;BM73,151;XA$(GS);C1
;XA$(G);":GS=G:GOTO 1690
1680 I=I+1:IF I>9 THEN I=0
1685 DRAW"C0;BM80,151;XA$(IS);C1
;XA$(I);":IS=I
1690 J=(F*100)+(G*10)+I:IF J>360
 THEN G=-1:GOTO 1670
1695 JB=J/57.2
1700 X=30+SIN(JB)*28:Y=160-COS(J
B)*28:CIRCLE(FA,FB),1,0:CIRCLE(X
,Y),1,1:FA=X:FB=Y:RETURN
1710 IF D7=10 AND N(S)=0 THEN RE
TURN ELSE LINE(30,160)-(SX,SY),P
RESET:DRAW"C0;BM83,170;XA$(D7);B
M-10,0;XA$(D6);BM-7,0;XA$(D5);C1
;XA$(10);BM+7,0;XA$(10);BM+10,0;
XA$(10);":LINE(128,40)-(IX,IY),P
RESET:CIRCLE(162,92+GX),1,0,.1:D
7=10:D6=10:D5=10
1712 IF AZ<AL THEN AZ=0
1730 SCREEN1,0:RETURN
1740 F=INT(RB(S)*.5729):G=INT(RB
(S)*5.729)-(10*F):I=INT(RB(S)*57
.29)-(100*F)-(10*G):DRAW"C0;BM66
,151;XA$(FS);BM+7,0;XA$(GS);BM+7
,0;XA$(IS);C1;XA$(I);BM-7,0;XA$(
G);BM-7,0;XA$(F);":FS=F:GS=G:IS=
I:JB=RB(S):GOTO 1700
1810 BX=SX(S)-TX:BY=SY(S)-TY:SD=
SQR(BX^2+BY^2)
1811 IF BX=0 THEN BX=.001
1812 IF BY=0 THEN BY=.001
1820 X=BY/BX:IF BX<0 THEN 1830 E
LSE SB=ATN(X):GOTO 1835
1830 SB=ATN(X)-3.1416
1835 IF S>16 THEN 2039 ELSE IF S
>6 THEN 1939
1839 IF SD/5280>10 THEN 1710
1840 CA=SB-(RB(S)-1.5708):DB=COS
(CA):IF ABS(DB)>.2588 THEN 1710
ELSE IF DB>.0523 THEN DB=.0523 E
```

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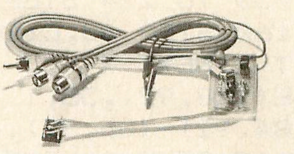

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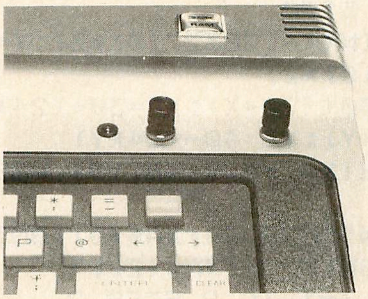

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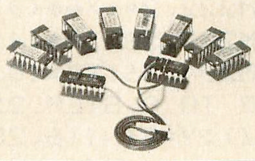

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Requires: 64K Extended and the CoCo Writer II. A disk drive is strongly recommended but not essential.

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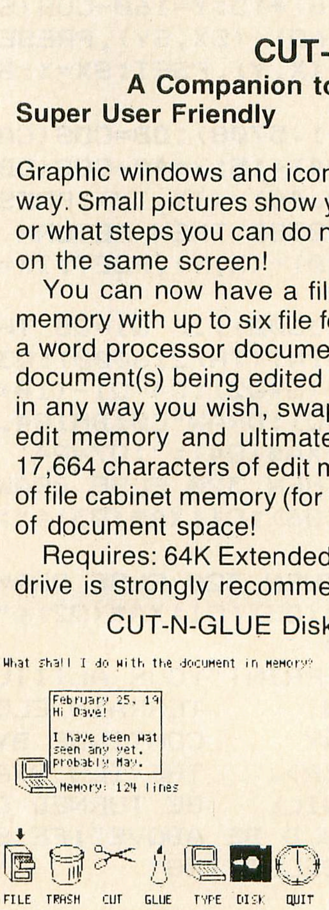
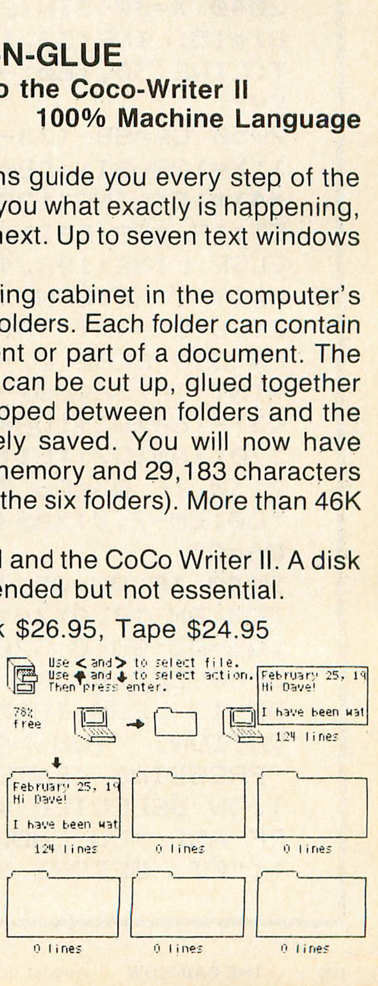


What shall I do with the document in memory?

February 25, 19
Hi Dave!

I have been wat
seen any yet.
probably May.

Memory: 124 lines



Use < and > to select file.
Use ↑ and ↓ to select action.
Then press enter.

78%
free

February 25, 19
Hi Dave!

I have been wat

124 lines

February 25, 19
Hi Dave!

I have been wat

124 lines

0 lines

0 lines

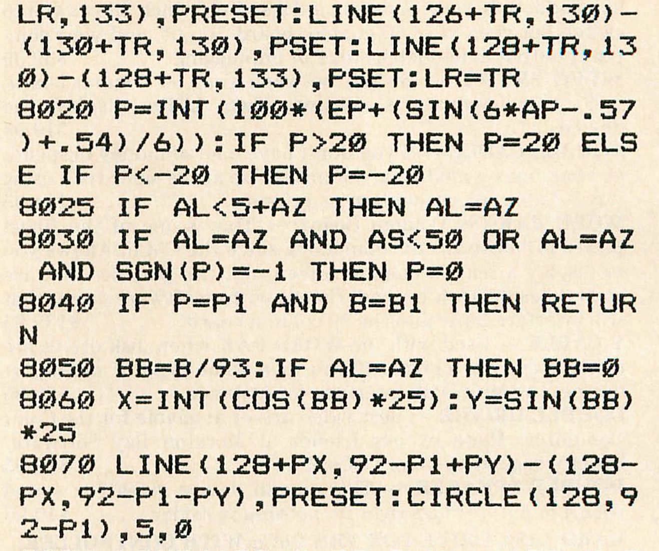
0 lines

0 lines

0 lines

```
LSE IF DB<-.0523 THEN DB=-.0523
1850 X=128-SIN(DB*20)*15:Y=40+CO
S(DB*20)*15:LINE(128,40)-(IX,IY)
,PRESET:LINE(128,40)-(X,Y),PSET:
IX=X:IY=Y
1855 AZ=FE(S):AR=AL-AZ:IF AR<0 T
HEN 3000
1860 X=((AR/(SD-1000))-.04366)*1
000:IF X>18 THEN X=18 ELSE IF X<
-18 THEN X=-18
1870 CIRCLE(162,92+GX),1,0,.1:CI
RCLE(162,92+X),1,1,.1:GX=X:GOTO
1940
1939 IF SD/528>999 THEN 1710
1940 X=30+SIN(SB)*15:Y=160-COS(S
B)*15:LINE(30,160)-(SX,SY),PRESE
T:LINE(30,160)-(X,Y),PSET:SX=X:S
Y=Y:IF S>6 GOSUB 2050
1950 SD=INT(SD/528):IF SD=D1 THE
N RETURN ELSE D2=INT(SD/100):D3=
INT(SD/10)-(10*D2):D4=SD-(100*D2
)-(10*D3):D1=SD:DRAW"C0;BM83,170
;XA$(D7);C1;XA$(D4);":D7=D4
1960 IF D3=D6 THEN RETURN ELSE D
RAW"C0;BM-10,0;XA$(D6);C1;XA$(D3
);":D6=D3
1970 IF D2=D5 THEN RETURN ELSE D
RAW"C0;BM-7,0;XA$(D5);C1;XA$(D2)
;":D5=D2:RETURN
2039 IF SD/528>1999 THEN 1710
2040 X=30+SIN(SB)*15:Y=160-COS(S
B)*15:LINE(30,160)-(SX,SY),PRESE
T:LINE(30,160)-(X,Y),PSET:SX=X:S
Y=Y
2050 CA=SB-(JB-1.5708):DB=COS(CA
):X=128-SIN(DB*4)*15:Y=40+COS(DB
*4)*15:LINE(128,40)-(IX,IY),PRES
ET:IF ABS(DB)>.2588 THEN RETURN
ELSE LINE(128,40)-(X,Y),PSET:IX=
X:IY=Y:RETURN
2100 Q1=INT(TH/3600):IF Q1=Q8 TH
EN 320 ELSE Q2=INT(TH/216000):Q3
=INT(TH/36000)-(6*Q2):Q4=Q1-(10*
Q3)-(60*Q2):Q8=Q1:DRAW"C0;BM184,
170;XA$(Q7);C1;XA$(Q4);":Q7=Q4
2130 IF Q3=Q6 THEN 320 ELSE DRAW
"C0;BM-7,0;XA$(Q6);C1;XA$(Q3);":
Q6=Q3
2140 IF Q2=Q5 THEN 320 ELSE DRAW
"C0;BM-10,0;XA$(Q5);C1;XA$(Q2);"
:Q5=Q2:GOTO 320
3000 CLS:PRINT:PRINT"YOUR ALTITU
DE IS LESS THAN      TERRAIN ELE
VATION.  YOU MAY     CONTINUE BY
 PRESSING <ENTER>.   THE ILS STA
TION SELECTED WILL   BE TURNED O
FF AND YOU SHOULD BE ABOVE";FE(S
);"FT. BEFORE SELECTING"
3005 PRINT"STATION '";CHR$(S+64)
;"' AGAIN."
3010 INPUT"";X:SCREEN1,0
3020 DRAW"C0;BM126,170;XN$(S);C1
;XN$(0);":S=0:D7=0:AZ=0:TIMER=0:
GOTO 1710
5000 FOR X=30 TO 224 STEP 194:FO
R Y=40 TO 160 STEP 60:CIRCLE(X,Y
),25,1:NEXT Y:NEXT X
5010 CIRCLE(128,92),55,1
5020 LINE(84,92)-(88,92),PSET:FO
R X=74 TO 110 STEP 6:LINE(86,X)-
(88,X),PSET:NEXT X
5030 LINE(168,92)-(172,92),PSET:
FOR X=74 TO 110 STEP 9:LINE(168,
X)-(170,X),PSET:NEXT X
5040 FOR Z=1 TO 3:GOSUB 5060:NEX
T Z
5050 FOR Z=5 TO 7:GOSUB 5060:NEX
T Z:GOTO 5100
5060 X=SIN((6.2832/10)*Z):Y=COS(
(6.2832/10)*Z)
5070 XA=30+(20*X):XB=30+(24*X):Y
A=40-(20*Y):YB=40-(24*Y)
5080 LINE(XA,YA)-(XB,YB),PSET:RE
TURN
5100 DRAW"BM28,24;XA$(0);BM39,58
;XA$(1);BM10,36;XA$(2);"
5200 FOR Z=1 TO 9 STEP 2
5210 X=SIN((6.2832/10)*Z):Y=COS(
(6.2832/10)*Z)
5220 XA=224+(20*X):XB=224+(24*X)
:YA=40-(20*Y):YB=40-(24*Y)
5230 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5250 DRAW"BM222,24;XA$(0);BM239,
36;XA$(2);BM233,58;XA$(4);BM210,
58;XA$(6);BM204,36;XA$(8);"
5300 FOR Z=2 TO 8 STEP 2:X=COS((
6.2832/10)*Z):Y=SIN((6.2832/10)*
Z)
5320 XA=224+(20*X):XB=224+(24*X)
:YA=100+(20*Y):YB=100+(24*Y)
5330 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5340 DRAW"BM237,113;XA$(2);BM215
,121;XA$(1);BM203,102;XA$(0);BM2
15,85;XA$(1);BM237,92;XA$(2);"
5350 LINE(114,15)-(142,25),PSET,
B:CIRCLE(128,19),18,1
5400 FOR Z=1 TO 5 STEP 2
5410 X=SIN((6.2832/8)*Z):Y=COS((
6.2832/8)*Z)
5420 XA=30+(20*X):XB=30+(24*X):Y
A=100-(20*Y):YB=100-(24*Y)
5430 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5450 DRAW"BM28,84;XA$(0);BM47,10
```

```
3;XA$(1);BM28,122;XA$(2);BM9,103
;XA$(3);"
5500 FOR Z=2 TO 11 STEP 3:GOSUB
5510:NEXT
5505 FOR Z=1 TO 10 STEP 3:GOSUB
5510:NEXT:GOTO 5540
5510 X=SIN((6.2832/12)*Z):Y=COS(
(6.2832/12)*Z)
5520 XA=30+(20*X):XB=30+(24*X):Y
A=160-(20*Y):YB=160-(24*Y)
5530 LINE(XA,YA)-(XB,YB),PSET:RE
TURN
5540 DRAW"BM28,144;XN$(14);BM47,
163;XN$(5);BM28,182;XN$(19);BM9,
163;XN$(23);"
5600 FOR Z=-1 TO 1
5610 X=SIN((6.2862/24)*Z):Y=COS(
(6.2862/24)*Z)
5620 XA=224+(30*X):XB=224+(33*X)
:YA=180-(30*Y):YB=180-(33*Y)
5630 LINE(XA,YA)-(XB,YB),PSET:NE
XT
5650 DRAW"BM206,154;XN$(5);BM238
,154;XN$(6);"
5660 CIRCLE(128,0),140,1,1,.23,.
29
5670 DRAW"BM128,135;ND5;BM+11,0;
ND3;BM+9,0;ND2;BM-31,0;ND3;BM-9,
0;D2;"
5680 LINE(62,142)-(88,153),PSET,
B:LINE(62,161)-(91,172),PSET,B:L
INE(163,161)-(192,172),PSET,B:LI
NE(122,161)-(134,172),PSET,B:DRA
W"BM80,169;U1;BM+94,0;N;D1;BU2;U
1;"
5705 FOR Z=-3 TO 3:A=Z/57.29:X=S
IN(A*20):Y=COS(A*20):XA=128-(19*
X):XB=128-(21*X):YA=40+(19*Y):YB
=40+(21*Y)
5710 LINE(XA,YA)-(XB,YB),PSET:NE
XT
5800 DRAW"BM126,170;XN$(0);BM66,
151;XA$(0);BM+7,0;XA$(0);BM+7,0;
XA$(0);"
5810 DRAW"BM50,65;XN$(13);BM+7,0
;XN$(16);BM+7,0;XN$(8);BM+0,+60;
XN$(13);BM-7,0;XN$(16);BM-7,0;XN
$(18);BM+151,0;XN$(9);BM-7,0;XN$
(22);BM-7,0;XN$(22);BM+0,-60;XN$
(1);BM+7,0;XN$(12);BM+7,0;XN$(20
);"
5900 RETURN
6000 DATA BU1U4E1R2F1NG4D4G1L2H1
BD1,U5E1R2F1D2NL4D3BL4,U6R3F1D1G
1NL3F1D1G1L3,BU1U4E1R2F1BD4G1L2H
1BD1,U6R2F2D2G2L2,U6R4BD3BL1L3D3
NR4
6010 DATA U6R4BD3BL1L3D3,BU1U4E1
R3BD4NL1D2L3H1BD1,U6BR4D3NL4D3BL
4,BU6BR1R2L1D6NR1L1BL1,BU6BR4D5G
1L2H1BD1,U6D3R1NE3NF3BD3BL1
6020 DATA NU6NR4,U6F2ND1E2D6BL4,
U6D1F4NU5D1BL4,BU1U4E1R2F1D4G1L2
H1BD1,U6R3F1D1G1L3D3,BU1U4E1R2F1
D3G1NH1NF1G1L1H1BD1
6030 DATA U6R3F1D1G1L3R1F3BL4,BU
5BR4H1L2G1D1F1R2F1D1G1L2H1BD1,BU
6R4L2D6BL2,BU1U5BR4D5G1L2H1BD1,B
U6BR4D2G1D1G1ND1H1U1H1NU2BD4,NU6
E2NU1F2NU6BL4
6040 DATA BU6D1F2E2NU1BD4ND1H2G2
D1,BU6BR4D1G2ND3H2NU1BD5,BU6R4D1
G4D1NR4
7000 DATA BU1U4E1R2F1NG4D4G1L2H1
BD1,BU6BR2NG1D6R1L2BL1,BU5E1R2F1
D1G1L1G2D1NR4,BU5E1R2F1D1G1NL1F1
D1G1L2H1BD1,BU2NR4U1E3D6BL3
7010 DATA BU6NR4D3E1R2F1D2G1L2H1
BD1,BU6BR2NR2G2D3U2R3F1D1G1L2H1B
D1,BU6R4D1G3D2BL1,BU1U1E1NR1H1U1
E1R2F1D1G1NL1F1D1G1L2H1BD1,BU4NF
1U1E1R2F1D2NL3D1G2L2
7020 DATA BU6D1F2E2NU1BD4ND1H2G2
D1
8000 TR=INT(B*COS(B/41)+.5):IF T
R=LR THEN 8020
8010 LINE(126+LR,130)-(130+LR,13
0),PRESET:LINE(128+LR,130)-(128+
LR,133),PRESET:LINE(126+TR,130)-
(130+TR,130),PSET:LINE(128+TR,13
0)-(128+TR,133),PSET:LR=TR
8020 P=INT(100*(EP+(SIN(6*AP-.57
)+.54)/6)):IF P>20 THEN P=20 ELS
E IF P<-20 THEN P=-20
8025 IF AL<5+AZ THEN AL=AZ
8030 IF AL=AZ AND AS<50 OR AL=AZ
 AND SGN(P)=-1 THEN P=0
8040 IF P=P1 AND B=B1 THEN RETUR
N
8050 BB=B/93:IF AL=AZ THEN BB=0
8060 X=INT(COS(BB)*25):Y=SIN(BB)
*25
8070 LINE(128+PX,92-P1+PY)-(128-
PX,92-P1-PY),PRESET:CIRCLE(128,9
2-P1),5,0
8080 LINE(128+X,92-P+Y)-(128-X,9
2-P-Y),PSET:CIRCLE(128,92-P),5,1
:P1=P:PX=X:PY=Y:B1=B:PE=EP:RETUR
N
```



COLOR TERM + PLUS +

If you're looking for the finest terminal software you can buy, look no further! And now we've added a **high-res screen** display that gives you 32 by 16, 42, 51, or 64 by 24 lines.* And you can switch between the high-res screen and the normal screen ***without*** destroying what you have in the buffer! **+ PLUS +** we have a buffer editor, complete up and down load support, on-line cassette or disk reads and writes, off-line and on-line scrolling, pre-entry of data before calling, word wrap, buffer printing, selective printing, change **any** parameter so you can communicate with **any** other computer. You can send and receive Basic programs, ASCII file, as well as machine code, **+ PLUS +** you can save your buffer to tape (Tape or Rom version) or disk (Disk version). You can communicate with the local **BBS, Compuserve™, The Source™,** the main frame at work or school, other color computers, Apples, IBM PC'S, TRS-80 Model I, II, III, IV, 12, 16, 100, or any other computer via RS-232.

Compare these features with ***any*** other terminal program:

32 × 16, 42, 51, 6 × 24 Screen
Communications BAUD Rate: 110-19200
Printer Baud Rate: 600-9600
Select Half or Full Duplex.
Select Odd, Even, or no Parity.
Select 7 or 8 Bit Words.
Send Control Characters.
Send a True Line Break.
Separate Keys for Escape and Rubout.
Select All Caps If Needed.
Word Wrap — Eliminate Split Words.
  (32 Character Mode)
Selectable Reverse or Normal Video.
  (32 Character Mode)

NOW WITH 42, 51 OR 64 CHARACTERS BY 24 LINES!

Scroll Protect Up to 9 Lines.
Automatic Capture of Incoming Files, Send One Line At a Time From Your Buffer.
Has Programmable Prompt for "Send Next Line!!"
Buffer Size Indicator.
Complete Up and Down Load Support.
Improved Buffer Editor.
On/Off Line Scrolling of Buffer.
On/Off Cassette or Disk Reads and Writes.
Pre-Enter Data Before Going On-Line.
Save/Load Machine Code, Basic Programs or Files.
Select Printer Line Feeds If Needed or Ignore All Line Feeds in Buffer.

*Disk and Rom Pack only (not on tape). PRICE: $29.95 (TAPE) $39.95 (ROM PACK) $39.95 (DISK)

BBS 817-387-8381

HARDWARE

SUPER PRO KEYBOARD — Mark Data replacement. . $64.95

DOUBLE SWITCH I — This is our original switch box. Two **LEDs** show you which port is being used, 1 or 2. High quality parts, and a new great looking yellow face plate $29.95

DOUBLE SWITCH II — Same as the above switch box, but we have added three RCA jacks, and a switch which allows you to switch between your 80 column board output, and your computer output at a touch instead of unplugging $39.95

VIDEO SWITCH — Switch between your 80 column board, and your computer's output. Two **LEDs** display the device $19.95

DOUBLE CABLE — If you don't have a lot of money to spend, you can hook a modem and a printer up at the same time using this Y-Cable. Works with most printers $14.95

WORD PAK (80 Column Board) — This is one of the finest pieces of hardware to come along since the CoCo. Allows you to display a real 80 column screen, not the graphics that are sometimes difficult to read. Comes with a software driver that will interface basic into the 80 column board $139.95

Y-CABLE — Used with the **WORD PAK** when disk drives are being used. Not needed if you own some type of multi-port device, the Multi-Pak interface for instance $29.95

DOUBLE DRIVER — Best video driver available for the Color Computer. Made by our friends at Moreton Bay Software. Specify regular CoCo or CoCo II $24.95

DOUBLE SPEAKER — This plug-in device gives you sound with a monitor. Plugs right in, nothing to solder $19.95

HARD DISK DRIVE FOR THE CoCo WITH CONTROLLER:

5 **MEG HARD DISK DRIVE**	$1299.95
10 **MEG HARD DISK DRIVE**	$1599.95

$2.00 shipping and handling on all orders. $3.00 charge on C.O.D. orders, Mastercard and VISA accepted. Texas residents add 5% sales tax. Allow two weeks for personal checks.

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NEW AND IMPROVED

DOUBLE DOS II

NEW AND IMPROVED!! Double Dos II is an enhanced version of our original **DOUBLE DOS** program. The original Double Dos was so well received that we decided to add even more capabilities, and fix some of the limitations in the original program. With Double Dos you can use 35, 40 or 80 track (double and single sided) drives all on one system, all at the same time. (The use of double sided drives will limit you to three drives.) Works with all types of 5¼ or 3 inch drive systems and All commands are supported in Double Dos! Double Dos is totally transparent to your basic programs! If your system selection is 80 tracks, a **FREE** command will return 158 granules! Compare this to the 68 granules your system now returns. You get 78 granules with a 40 track drive, 10 more than the 35 track system. **EVERY** command in basic is supported by Double Dos. There is only one limitation, you can only open any number of files to one drive at a time, otherwise everything else is the same. Plus you get some great new commands!! Look at what Double Dos will allow as new disk basic commands:

BAUD 1-6 ... change the **BAUD** rate with a command, no pokes!

TRACK 35,36,40,80 ... change the number of tracks.

DOUBLE ... enable the double sided option.

PDIR ... print your directory to the printer.

DUMP ON/OFF ... send a basic program to a friend without using a terminal program!

RATE 6,35 ... change the head stepping rate.

VIDEO ON/OFF ... will give you a reverse screen without a hardware modification.

SCROLL 1-255 ... change the screen scrolling speed.

COMMAND ... will list all new commands.

DUPE 0-2 ... will allow copy & backup from one side of a disk to the other side on double sided systems!

DATE ... you can enter the month, day, and year which will be stored in the directory of your disk each time you save a program or file, and you can see it when you use the DIR command! Very useful when looking for the most current file or program!

AND, all commands can be used inside basic programs because they have been added to disk basics list of commands! You also get full reset protection, which means that you will stay in the 64K mode until you power-down.

PRICE: $29.95 (DISK ONLY) 64K Required

NEW

REAL EIGHTY-COLUMN DISPLAY!

NEW

ULTRA TERM +

PROFESSIONAL PROFESSIONAL PROFESSIONAL PROFESSIONAL

This program is the **ultimate** in coco communicating!! ***Ultra* Term +** is used with a plug-in 80 column board* that gives you **True** 80 columns, not the graphics display that is unreadable at 80 columns. This is truly a ***Professional*** Package that is so easy to use that once you have used it, you'll wonder why other packages are so difficult to use, (except for Color Term + Plus + that is!) After using a terminal program that cannot give you **True** mainframe terminal emulation, you will find ***Ultra* Term +** indispensable! ***Ultra* Term +** even has a host mode that allows you to echo characters like full duplex mainframes do! There are also 10 macro keys which will allow you to save passwords, phone numbers, modem programming information, etc. + PLUS + you can save them to disk. Also, like all ***Professional*** terminal programs you can save your current parameters. This saves you set up time when moving from one system to another. + Plus + when used with the parallel printer port** you can print what is coming in. And what about documentation? Every feature is explained in detail and indexed for fast look up! There is also a comprehensive help section to aid those unfamiliar with telecommunications. Although this program was designed for the Professional a total novice can use it with ease. Check all the features listed below and then you decide who has the world's smartest terminal!

Baud Rates: 110-4800 (communicate)
600-9600 (printer).
Screen Format: 80 x 25 w/true upper & lower case.
Select half, full duplex or echo.
Select odd, even, mark, space or no parity.
Send all 128 characters from keyboard.
Select 7 or 8 bit words.
Select 1 or 2 stop bits.
Send a true line break.
Select all caps if needed.
Automatic capture of incoming files.
X on/X off capabilities.
Merge text or programs in buffer.
53,000 character buffer (64**K**).
Send and receive BASIC, FILES and machine code.
10 macro keys.
Four buffer send modes (dump, prompted, manual & time delay).
Buffer size indicators (bytes used & bytes remaining).
Buffer editor w/auto key repeat.
Scroll forward & reverse to view buffer & print viewed screen option.
Selectable printer formats (line feeds, etc.).
Selectable trapping of incoming characters.
Print while receiving data*
Buffer editor has these features:
Move forward and reverse through buffer. Insert, type over, delete lines or characters.
Block deletion or start to end of buffer delete.
Save and load macros.
Save and load parameters.
Use 1-4 disk drive (w/SAVE, LOAD, DIR. & granule display).
Easy to use MENU driven format.
Comprehensive users manual.
Works with **ALL** Radio Shack™ Disk Systems and **all** models of color computers.

Still not convinced? How about a 15 day, money back guarantee? If you don't like the package for any reason, we will refund your money upon return of a like-new package.† Who out there is offering you this kind of deal? And customer support was never better. Simply fill out your registration card and send it back to us and you will be notified when new features, improvements, etc. become available because all registered owners will receive **Free** upgrades for a $5.00 shipping and handling fee).

As with all good Professional programs, ***Ultra* Term +** is **all machine code.** This program has been tested by those both familiar and unfamiliar with communications programs. And when you call for some technical support, you **won't** get an answering machine during our business hours (10-5 CST M-Sat.) under normal circumstances. Technical help is usually available all day.

PRICE: *Ultra* Term + — $55.95 (Disk)
Word·Pak (80-column board; includes a software driver so you can use your basic programs with no modification in most cases!). . . . **$139.95** + $3.00 S&H
Y-Cable. . .**$29.95** (Required if expansion port not used with disk drives)
Complete Package ***Ultra* Term +**, Word Pak & Y Cable [subtract $20.00 if not needed] is only **$210.00**

*****Ultra* Term +** supports the 80 column board made by PBJ, Inc. If you already have the board, simply order the program, but those of you who don't can get a good deal.

**Parallel Printer Port from PBJ, Inc.

†Less $10.00 restocking charge.

DOUBLE SPOOLER

Tired of waiting for your listings? printouts? etc.? This is THE Spooling Program!! No need to save your programs in ASCII. You can also spool your files and you can spool **ANYTHING** you print on the screen while a program is running! Requires a minimum of 32K **AND** the 64K computer can spool really **LARGE** files!! Plus more!! PRICE: $19.95 (Tape) $21.95 (Disk)

DOUBLE MAILER

At last a powerful, easy to use, mailing list program for a reasonable price. Up to 200 names can be held in memory for you to change, modify, search or print as you like. Plus, you can print out up to 1800 names without touching the keyboard. Save **thousands** of names on each disk. The machine language sort routine will sort 200 names in as little as 6 seconds! Supports single or double wide labels. Three and four line labels can be intermixed without leaving gaps in your listings! All menu driven, and easy to use. Printer support gives 600-9600 **BAUD** selection, and different print sizes if you wish. 16K Extended

NEW

Double 80 Plus

NEW

Announcing a **BREAK-THROUGH!** Now you can own an 80 column board for $99.95. And you can choose the software you want to buy instead of being charged for something you don't want. Y-Cable available for use with disk drives. Look at these features and compare:

TRUE 80 COLUMN OUTPUT
BUILT IN SWITCH FOR COCO OR DOUBLE 80 PLUS
ADJUSTABLE VIDEO OUTPUT
GOLD PLATED EDGE CONNECTOR
DRIVERS AVAILABLE FOR BASIC, OS9 and **FLEX**
DISPLAY ALL ASCII CHARACTERS
ALTERNATE CHARACTER SETS AVAILABLE
METAL CASE (not cheap plastic)
ULTRA TERM + available for this board
BACKED BY A 90 DAY PARTS AND LABOR WARRANTY

PRICES:	**DOUBLE 80 PLUS** (80 column board)	$99.95
	Y-CABLE	29.95
	BASIC DRIVER	12.95
	OS9 DRIVER	12.95
	FLEX DRIVER (available soon)	12.95
	ULTRA TERM + (disk only)	55.95

Watching it all add up + with . . .

The IRA Projection

By Leonard Hyre

One of the best ideas the federal government has had in the last decade has to be the Individual Retirement Account (IRA). It gives the average person the chance to build a future retirement fund without paying the price of taxation now on the money he puts away. People who are considering such accounts invariably wonder about just how it all adds up, and rightly so! I love to plug in the various figures and watch the theoretical interest come pouring in. You can get some practical use out of my *IRA Projection* program and, at the same time, kick around lots of figures just to be sure you are making the right choice of planning or financial institution.

One of the reasons I bought the CoCo is that it is a *Color* Computer. So why does a practical program have to be blah? It doesn't! Programs can be colorful, have lots of bells and whistles, and still perform a quality service for the user. I've tried to emphasize this theme with *IRA Projection.*

A nifty looking title screen is always a big plus to me when I *RUN* or *EXEC* a program. It doesn't have to eat up 6K of memory and require two or three machine language subroutines to be effective. The screen should have a little color, be theme oriented (to the program) and possibly make a bit of noise. Now let's see about the screen for this program. Color? Well, IRA s are money and money is traditionally green in the United States, so that kind of takes care of itself. It is green and black. (Take a look, it really has more color than you might think.)

Theme? Once again, IRAs go with money so a big dollar sign will do nicely. Now put the title on the screen by popping the letters into place with a tiny blip of noise and the deed is done. Tell the folks who wrote the program, "I used a single *DATA* statement to list the letters needed and then used several loops to put them in place." These are at Lines 110-180 in the listing.

Now we get down to business. Line 200 changes the screen to the alternate red/orange color set. Data to be required of the user is now gathered with a few simple *INPUT* commands. The screen is cleared and the formula applied to the data to give us the required figures. A loop made up of the number of years required is set up in 350. When the calculation is done, we have our answer for the year represented by the value G at that time. The formula is standard, which can be obtained from any financial institution.

After getting the data, we need to display it. Here is where the CoCo can shine. The *PRINT USING* command makes these things easy for CoCo users. Owners of many other machines can't even tell the computer where or how to print without writing major subroutines. If you skipped over this one in *Going Ahead With Extended Basic,* do yourself a favor and go back and learn to use it. It's one of my favorites. (Do you have to be nuts to have a favorite BASIC command?) Anyway, we have it all on the screen.

Only one thing left to do now, let those with printers have an option to obtain hard copy of the information. Lines 430-670 deal with the printer routine and may be totally left out by those of you who do not own a printer. Just take the

---

(Leonard Hyre, employed by the Social Security Administration as a claims representative, is the author of Harness Handicapper, Thoroughbred Handicapper, *and* Greyhound Handicapper, *from Federal Hill Software. He is also the author of several* RAINBOW *articles and other published programs)*

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'P' option out of Line 400 and modify 420 to read: *420 GOTO 200.*

I often use the same routine for screen and printer format using a *Print #-X* type of style. However, the display of the information given here requires a different display for the printout if we want it to be attractive. Notice that 'A' and 'B' values are reset to 0 in Line 570. Data input earlier is then used to recalculate and print out the year by year accumulation.

IRA Projection is a relatively short program and should not present much of a typing challenge to you. I believe you will find the program worthwhile.

```
160...... 127
340...... 234
500....... 54
END .... 241
```

The listing:

```
10 '****************
20 '*IRA PROJECTION*
30 '*   (C) 2/84   *
40 '*    L.HYRE    *
50 '* CAMBRIDGE MD *
60 '****************
70 '
80 '
90 ' 16K EXTENDED BASIC REQUIRED
100 DATA I,N,D,I,V,I,D,U,A,L,R,E
,T,I,R,E,M,E,N,T,A,C,C,O,U,N,T,S
,b,y,,l,e,o,n,a,r,d,,h,y,r,e
110 CLS0:A1$=STRING$(5,143):A2$=
CHR$(143)
120 POKE359,126:SCREEN0,1
130 PRINT@16,A2$;:PRINT@43,A1$+A
2$+A1$;:PRINT@75,A2$+STRING$(4,1
28)+A2$+STRING$(4,128)+A2$;:PRIN
T@107,A2$+STRING$(4,128)+A2$;:PR
INT@139,A2$+STRING$(4,128)+A2$;:
PRINT@171,A1$+A2$+A1$;:PRINT@208
,A2$+STRING$(4,128)+A2$;
140 PRINT@240,A2$+STRING$(4,128)
+A2$;:PRINT@267,A2$+STRING$(4,12
8)+A2$+STRING$(4,128)+A2$;:PRINT
@299,STRING$(11,143);:PRINT@336,
A2$;
150 PR=34:FORI=1TO10:READA$:PRIN
T@PR-1,CHR$(143)+A$+CHR$(143);:P
R=PR+32:PLAY"T255O4CEO5CE":NEXT
I
160 PR=62:FORR=1TO10:READA$:PRIN
T@PR-1,CHR$(143)+A$+CHR$(143);:P
R=PR+32:PLAY"T255O4CEO5CE":NEXTR
170 PR=428:FORAT=1TO8:READA$:PRI
NT@PR,A$;:PR=PR+1:PLAY"T255O4CEO
5C3":NEXTAT
180 FOR DL=1TO300:NEXT:PR=456:FO
RNA=1TO15:READA$:PRINT@PR,A$;:PR
=PR+1:PLAY"O4CC":NEXT NA
190 FORDL=1TO700:NEXT
200 POKE359,57:SCREEN0,1:CLS
210 PRINT:PRINTSTRING$(32,205);:
PRINT"  INDIVIDUAL RETIREMENT AC
COUNT ";:PRINTSTRING$(32,203);:P
LAY"V31T20O3CO4CO5C"
220 A=0:B=0
230 INPUT"YOUR NAME:";N$:IF LEN(
N$)>12 THEN PRINT"SHORTER PLEASE
":PLAY"T8O1ECE":GOTO 230
240 PLAY"T20O4CE"
250 INPUT"TOTAL DEPOSIT PER YEAR
";C
260 PLAY"T20O4CE"
270 INPUT"ANTICIPATED % INTEREST
";D
280 PLAY"T20O4CE"
290 INPUT"NO.TIMES COMPOUNDED/YR
";E
300 PLAY"T20O4CE"
310 INPUT"NO.YEARS TO PROJECT...
";F
320 PLAY"T20O4CE"
330 CLS:GOSUB430
340 FOR G=1TO F
350 A=(1+D/(100*E))^E*(A+C)
```

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```
360 B=FIX((100*A)+.5)/100
370 PRINTUSING"##";G;:PRINTUSING
"  $#######.##";B:PLAY"T250V31O1
CE"
380 IF G/10=INT(G/10) GOSUB 440
390 NEXT G
400 PRINT:PRINT"   [ PRESS 'P' F
OR PRINTOUT ]":PRINT"[ANY OTHER
= ANOTHER PROJECTION]":FORS=1TO3
:PLAY"T50V31O3CO5C":NEXTS
410 AN$=INKEY$:IFAN$=""THEN 410
420 IF AN$="P"THEN 480 ELSE 200
430 PRINTSTRING$(32,133);"IRA PR
OJECTION FOR ";N$:PRINTSTRING$(3
2,133);:RETURN
440 PRINT" [    PRESS ANY KEY TO
CONT.  ] ";
450 AN$=INKEY$:IFAN$=""THEN 450
460 CLS:GOSUB430
470 RETURN
480 POKE359,126:SCREEN0,1:CLS
490 PRINT:PRINTSTRING$(33,159);"
PRINTING OPERATION IN PROCESS ";
STRING$(33,159);
500 PRINT:PRINT:PRINT:PRINT"
   ONE MINUTE PLEASE"
510 PRINT#-2,STRING$(80,"=")
520 PRINT#-2,"INDIVIDUAL RETIREM
ENT ACCOUNT PROJECTION FOR: ";N$
530 PRINT#-2,"BASED ON DEPOSITS
OF $";C;" OVER ";F;" YEARS"
540 PRINT#-2,"ANTICIPATED INTERE
ST RATE IS ";D;"% COMPOUNDED ";E
;" TIMES/YEAR"
550 PRINT#-2,STRING$(80,"-")
560 H=0
570 A=0:B=0
580 FOR G=1 TO F
590 A=(1+D/(100*E))^E*(A+C):B=FI
X((100*A)+.5)/100
600 PRINT#-2,TAB(25);
610 PRINT#-2,"YEAR # ";:PRINT#-2
,USING"##";G;:PRINT#-2,"    ";:P
RINT#-2,USING"$#######.##";B
620 NEXT G
630 PRINT#-2:PRINT#-2,TAB(13);"T
OTAL DEPOSITS=";:PRINT#-2,USING"
$#######.##";C*F;:PRINT#-2," FOR
NET INCREASE OF ";:PRINT#-2,USIN
G"$#######.##";B-(C*F)
640 PRINT#-2:PRINT#-2,STRING$(80
,"=")
650 PRINT:PRINT:PRINT"      OPER
ATION COMPLETE":FORS=1TO3:SOUND
225,1:NEXTS
660 FOR DL=1TO400:NEXT
670 POKE359,57:SCREEN0,1:CLS:PRI
NTSTRING$(32,207):GOTO 400
```

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Simplified Saves

For disk users:

3 GOTO 10
5 KILL "PROGRAM/BAS" : SAVE"PROGRAM" : END
10 ' THIS IS FIRST LINE OF PROGRAM

To use, first *SAVE "PROGRAM"* (your program name) in the usual fashion. Thereafter, just type *RUN 5* ENTER. This is especially handy during debugging.

For cassette users, change Line 5 to read:

5 FOR S = 1 TO 3 : CSAVE"PROGRAM" : MOTORON : FOR DL* 1 TO 460 *3 : NEXT DL : MOTOROFF : SOUND 200,1 : NEXT S : END

To use, set the recorder to record mode, then type *GOTO5* ENTER or *RUN5* ENTER. Line 5 will then *CSAVE* the program three times, putting a three second "rewind gap" between each of the saves and after the last save. The *SOUND* command may be deleted, but it's a handy signal which reminds you to jot down the tape counter number.

A special note to *Worksaver* users, cassette or disk: store the applicable Line 5 from the above as a key definition, then to do a whole save routine it takes only two (at most three) keystrokes!

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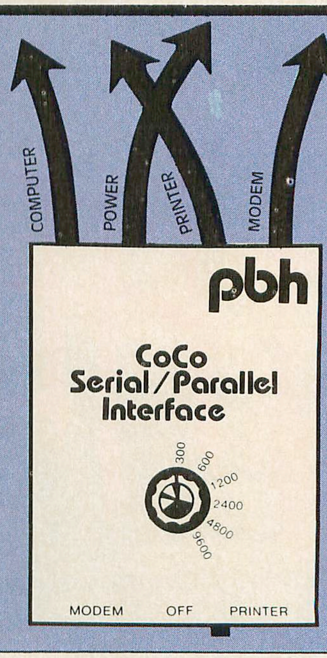

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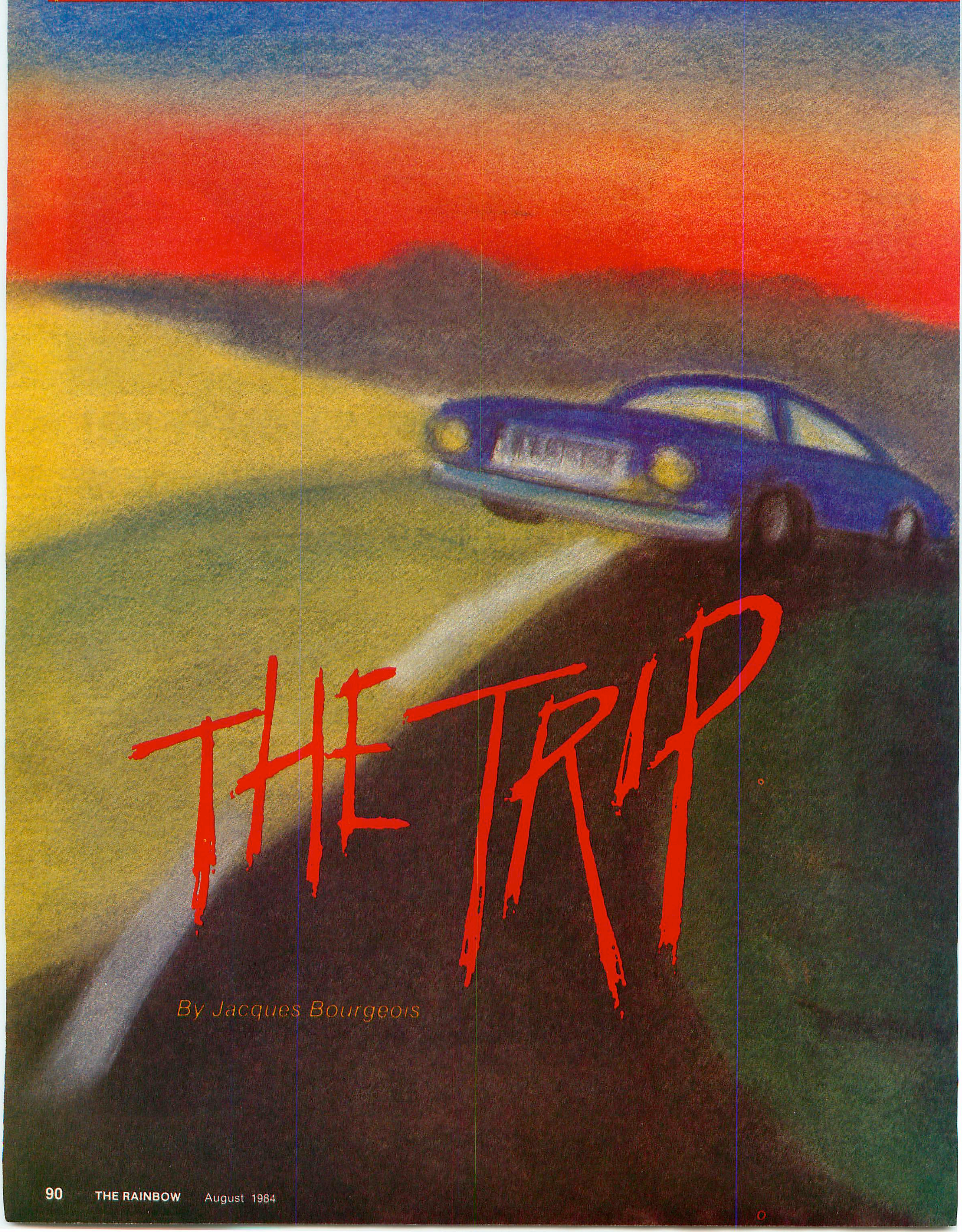


THE TRIP

By Jacques Bourgeois

32K
ECB

The Trip is a 32K Hi-Res Adventure game that you play mostly with a joystick. The main element of the game is a car which you ride on a main road. This main road crosses 10 different side roads on which you go to find the objects you need.

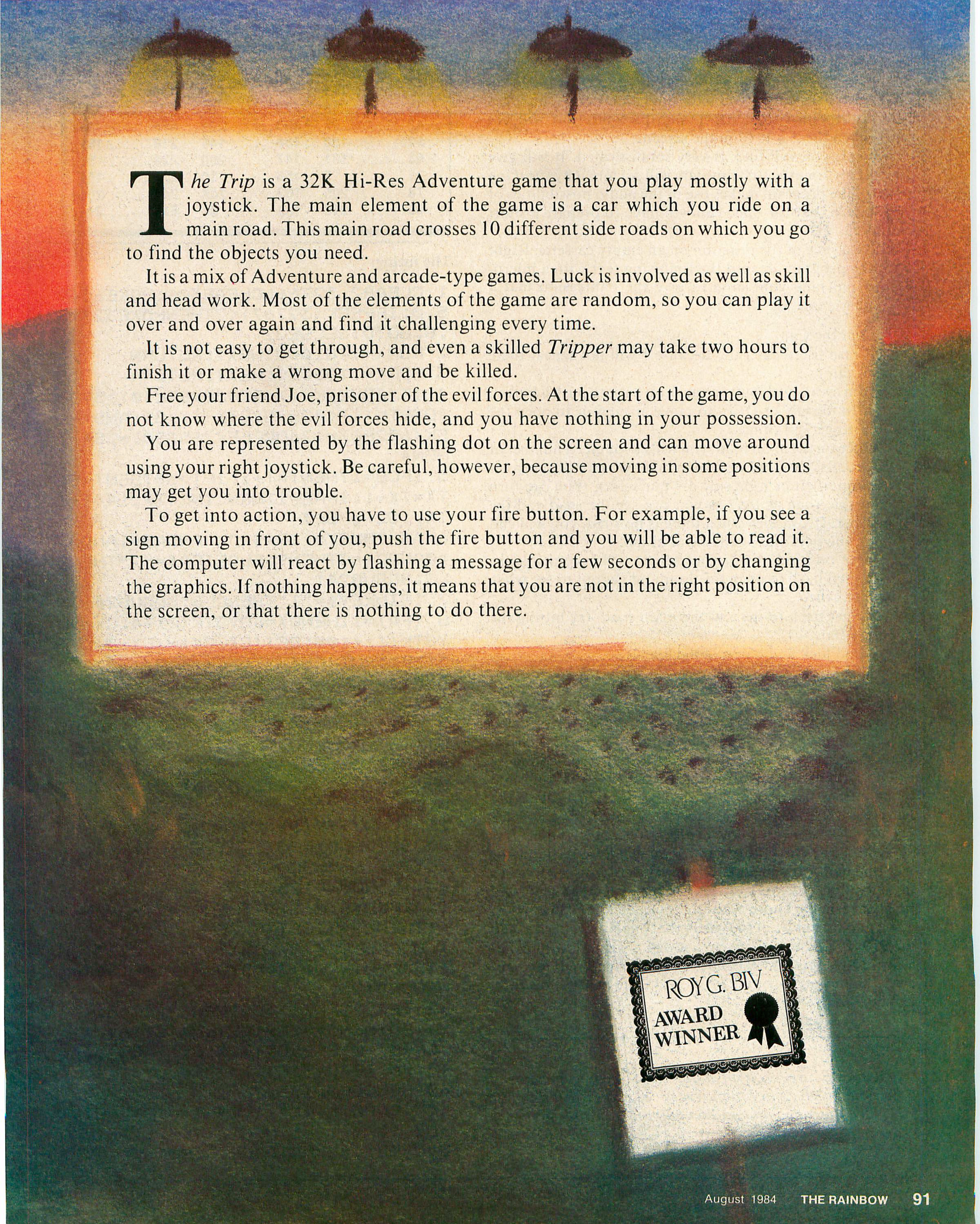
It is a mix of Adventure and arcade-type games. Luck is involved as well as skill and head work. Most of the elements of the game are random, so you can play it over and over again and find it challenging every time.

It is not easy to get through, and even a skilled *Tripper* may take two hours to finish it or make a wrong move and be killed.

Free your friend Joe, prisoner of the evil forces. At the start of the game, you do not know where the evil forces hide, and you have nothing in your possession.

You are represented by the flashing dot on the screen and can move around using your right joystick. Be careful, however, because moving in some positions may get you into trouble.

To get into action, you have to use your fire button. For example, if you see a sign moving in front of you, push the fire button and you will be able to read it. The computer will react by flashing a message for a few seconds or by changing the graphics. If nothing happens, it means that you are not in the right position on the screen, or that there is nothing to do there.



You can press 'I' any time the cursor is present on the screen to get an inventory of what you have. Pressing the Space Bar in the same conditions will automatically bring you back to the car (if you have one) and it can sometimes help in difficult situations. 'I' and the Space Bar will not work when there is text on the screen.

The car, you will find, is very sophisticated. It will give you instructions the first time you will get into it by *speaking to you*. The program makes use of the audio possibilities of your CoCo, but for that, you will have to prepare a short recording.

Make a save of the program on an empty cassette. Right after the program, record the following text with a microphone, pinching your nose to give the impression that a computer is talking:

> I am the Car.
>
> Please listen carefully because I will not repeat these instructions.
>
> I am an all push button car. You have to push a button to turn me ON or OFF, to move around or to open the door to get out of me.
>
> Once on the main road, you will encounter a number of side roads. Each one bears a number which will appear at the upper-left or right side of your screen. You can turn on a side road as long as you can see the road and the number. If you turn when there is no road, you will end up in the field and lose control of me.
>
> Once on a side road, your screen will become blank. You then have to open the door and get out to see what happens there.
>
> To get back to me and the main road, try hitting the Space Bar.
>
> Good luck and have a good trip.
>
> This recording will self-destruct within 10 seconds.

If you leave the recorder on play after loading the game, the message will be heard through your TV the first time you enter the car. The recorder will shut off after one minute of play, so make your recording less than one minute long.

The computer will be in a long loop during that time and will not accept any command. If you want to get rid of that feature, delete the end of Line 99 from *:IFPEEK*. This program will not run with the disk drive plugged in.

As with any Adventure game, you will have to find your way through it. If you are stuck somewhere, you can write to me, including 50 cents to cover the cost of postage, and I will be glad to help. Those who do not have the RAINBOW ON TAPE and do not want to type in the long program can send me $10 to purchase a cassette. A disk version is also available for $15. It is somewhat better and faster, but it does not have the message from the car. Write me at 105 Poincare, Lonqueuil, Quebec J4L 1B2.

(Jacques Bourgeois is an audio-visual technician who became involved in computers because they will soon replace the video and audio equipment he uses every day.)

11	118	100	195	179	96
24	109	112	219	190	207
35	216	122	67	201	183
42	97	133	201	208	1
52	130	138	146	218	181
63	131	147	200	228	93
71	5	156	10	238	155
78	205	162	248	244	205
85	218	168	84	END	218

The listing:

```
1 CLEAR2,32766:CLEAR300:POKE6549
5,0:IFPEEK(32767)<7THENPOKE32767
,8:GOTO16ELSE22
2 FORX=1TO1000:NEXT:RETURN
3 FORX=1TO3000:NEXT:RETURN
4 IF(JOYSTK(0)<4ORJOYSTK(0)>59OR
JOYSTK(1)<4ORJOYSTK(1)>59)AND(PE
EK(65280)=126ORPEEK(65280)=254)T
HEN4
5 IFC8=1THENT=T+1:IFT>30THENT=0:
TX=TX-1:IFAP=1THENLINE(TX,144)-(
TX,152),PSET
6 A$=INKEY$:IFA$=" "ANDA8=1ANDAT
=0ANDC6=0THEN91ELSEIFA$="I"THENC
LS:GOSUB241
7 IFINKEY$="I"THENCLS:GOSUB241
8 IFAT=1THENCX=JOYSTK(0)*4:CY=JO
YSTK(1)+108:GET(CX,CY)-(CX+3,CY+
3),M::PUT(CX,CY)-(CX+3,CY+3),A2:
FORX=1TO9:NEXT:PUT(CX,CY)-(CX+3,
CY+3),M:RETURN
9 PUT(CX,CY)-(CX+3,CY+3),M:IFJOY
STK(0)<4THENCX=CX-8:IFCX<1THENCX
=1:GET(CX,CY)-(CX+3,CY+3),M ELSE
GET(CX,CY)-(CX+3,CY+3),M:SOUND12
5,1
10 IFJOYSTK(0)>59THENCX=CX+8:IFC
X>252THENCX=252:GET(CX,CY)-(CX+3
,CY+3),M ELSEGET(CX,CY)-(CX+3,CY
+3),M:SOUND125,1
11 IFJOYSTK(1)<4THENCY=CY-3:IFCY
<1THENCY=1:GET(CX,CY)-(CX+3,CY+3
),M ELSEGET(CX,CY)-(CX+3,CY+3),M
:IFJOYSTK(0)>3ANDJOYSTK(0)<60THE
NSOUND125,1
12 IFJOYSTK(1)>59THENCY=CY+3:IFC
Y>188THENCY=188:GET(CX,CY)-(CX+3
,CY+3),M ELSEGET(CX,CY)-(CX+3,CY
+3),M:IFJOYSTK(0)>3ANDJOYSTK(0)<
60THENSOUND125,1
13 IFPPOINT(CX-1,CY-1)=1ORPPOINT
(CX-1,CY-1)=5THENPUT(CX,CY)-(CX+
3,CY+3),A2:RETURNELSEPUT(CX,CY)-
```

```
(CX+3,CY+3),A1:RETURN
14 FORX=1TO2000:NEXT:RETURN
15 DATAt,h,e,,t,r,i,p
16 A$=STRING$(32," "):CLS0:PRINT
@226,"WELCOME";:PRINT@234,"TO";:
PRINT@160,A$;:PRINT@288,A$;
17 PLAY"L3O1EEEL1C":Y=236
18 FORZ=1TO8:Y=Y+2:READA$:PRINT@
Y,A$;:IFA$<>""THENSOUND250,3:GOS
UB2:NEXTELSEGOSUB2:NEXT
19 PLAY"L3O1AAAL1F":GOSUB2
20 PRINT@352,"  C. JACQUES BOURG
EOIS - 1983
21 FORX=1TO255STEP3:SOUNDX,1:NEX
T
22 CLS0:PRINT@256,"  WE HOPE YOU
 WILL STAY ALIVE           HA!
 HA! HA!"
23 DIMA1(3,3),A2(3,3),M(3,3),R(1
0),RS(10),C(16,16),D(3,3),E(3,3)
,F(3,3)
24 Y=RND(10):FORX=1TO10:IFR(X)=Y
 THEN24
25 IFR(X)=0THENR(X)=Y:IFX=10THEN
26ELSEGOTO24ELSENEXT
26 Y=RND(10):FORX=1TO10:IFRS(X)=
Y THEN26
27 IFRS(X)=0THENRS(X)=Y:IFX=10TH
EN28ELSEGOTO26ELSENEXT
28 PMODE3:PCLS4:GET(10,10)-(26,2
6),C:PCLS:GET(0,0)-(3,3),A1
29 BO$="U48R48D48NL48H48
30 LINE(0,0)-(9,9),PSET,BF::PAIN
T(2,2),2,1:GET(1,1)-(4,4),A2
31 PMODE3:PCLS:SCREEN1,0
32 DRAW"BM0,96C3R255":DRAW"BM0,8
0E2F2":FORX=1TO63:DRAW"BM-4,+1;E
2F2BU1E2F2":NEXT:PAINT(2,84),2,3
:PAINT(1,1),3,3:DRAW"BM0,96C2R25
5
33 FORZ=1TO50:X=RND(255):Y=RND(9
5):PSET(X,Y,2):NEXT:CIRCLE(50,20
),10,2:PAINT(50,20),2,2
34 AT=0:COLOR4,1:LINE(8,96)-(56,
68),PSET,BF:LINE(84,104)-(220,52
),PSET,BF:CIRCLE(182,52),24,4:PA
INT(182,51),4,4:DRAW"BM182,28C1U
8
35 DRAW"BM16,76;C3R32D20L32U20":
PAINT(32,84),2,3:DRAW"BM16,80;R3
2":FORY=1TO3:DRAW"BM-32,+4;R32":
NEXT:DRAW"BM170,88;R24D16L24U16"
:PAINT(182,96),3,3
36 LINE(84,52)-(220,56),PRESET,B
F:FORX=164TO196STEP8:IFX<>180THE
NLINE(X,56)-(X+4,104),PRESET,B:P
```

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```
AINT(X+2,57),1,1:NEXTELSENEXT:LI
NE(182,20)-(182,28),PSET:LINE(84
,104)-(220,104),PSET
37 COLOR4,1:FORX=88TO148STEP20:L
INE(X,64)-(X+12,76),PRESET,BF:PA
INT(X+2,65),2,4:LINE(X+6,60)-(X+
6,80),PSET:NEXT:LINE(86,70)-(162
,70),PSET:FORY=64TO88STEP24:LINE
(204,Y)-(216,Y+12),PRESET,BF:PAI
NT(212,Y+1),2,4:LINE(202,Y+6)-(2
18,Y+6),PSET:NEXT
38 LINE(210,60)-(210,102),PSET:F
ORX=92TO128STEP36:LINE(X,84)-(X+
28,100),PRESET,BF:PAINT(X+2,90),
2,4:NEXT:FORY=80TO96STEP4:LINE(8
8,Y)-(160,Y),PSET:NEXT:FORX=98TO
114STEP8:LINE(X,83)-(X,101),PSET
:LINE(X+36,83)-(X+36,101),PSET:N
EXT
39 COLOR3,1:LINE(4,172)-(16,96),
PSET:LINE(48,96)-(60,172),PSET:L
INE(158,172)-(170,104),PSET:LINE
-(194,104),PSET:LINE-(206,172),P
SET:DRAW"BM0,172R4BR56R98BR48R50
":PAINT(30,191),3,3:DRAW"BM160,1
04C4R40
40 COLOR2,1:FORX=1TO255:Y=RND(10
)-2:LINE(X,191)-(X,191-Y),PRESET
:NEXT:DRAW"BM136,168U12L8U12R16D
12L8BR92L8U12R16D12L8D12":PAINT(
132,148),2,2:PAINT(226,148),2,2
41 FORX=132TO224STEP92:FORY=148T
O152STEP4:FORW=0TO9STEP2:PSET(X+
W,Y,3):NEXTW,Y,X
42 IFPEEK(32766)=7THENCX=36:CY=1
10ELSECX=180:CY=170
43 A1=0:A2=0:GET(CX,CY)-(CX+3,CY
+3),M
44 IFA1=1THENDRAW"BM16,76C4R32D2
0L32U20":PAINT(32,84),3,4:PAINT(
32,78),3,4:PAINT(32,92),3,4
45 IFA2=1THENDRAW"BM179,88C2R7D1
5L7U15":PAINT(183,90),2,2
46 GOSUB4
47 IFCY<172ANDCX>0AND(CX<173ORCX
>189)THENIFPPOINT(CX-1,CY-1)=1OR
PPOINT(CX+4,CY+4)=1THENCLS:PRINT
@101,"YOU HEAR A DOG BARKING":A3
=A3+1:GOSUB14:ELSEA3=0
48 IFA3>1THENA3=0:PRINT@192,"YOU
 STAYED TOO LONG ON THE GRASSTHE
 INVISIBLE DOG COMES AND EATSYOU
.":IFAC=1THEN243ELSE248
49 SCREEN1,0:IF(CX<84 ANDA1=0 AN
DCY<96)OR(CX>84ANDA2=0ANDCY<104)
THENPUT(CX,CY)-(CX+3,CY+3),M:CY=
CY+4:GET(CX,CY)-(CX+3,CY+3),M
50 IFA2=1ANDCX>172ANDCX<190ANDCY
<104THEN58
51 IFA1=1ANDCX<48ANDCX>12ANDCY<9
6THEN61
52 IF(PEEK(65280)=126ORPEEK(6528
0)=254)THEN53ELSEGOTO46
53 IFCX<48ANDCX>12ANDA1=0ANDCY>9
4ANDCY<100THENA1=1:GOTO44
54 IFCY<172THEN56ELSEIFCY<182AND
CX>126ANDCX<142THENCLS:PRINT@232
,"THE SIGN READS:":PRINT@295,"KE
EP OFF THE GRASS":GOSUB3:GOSUB2:
SCREEN1,0
55 IFCY<182ANDCX>218ANDCX<238THE
NCLS:PRINT@232,"THE SIGN READS:"
:PRINT@290,"BEWARE OF THE INVISI
BLE DOG":GOSUB3:SCREEN1,0
56 IFA2=0ANDCX>172ANDCX<190ANDCY
<107THENA2=1:GOTO45
57 GOTO46
58 CLS0:PRINTSTRING$(32,CHR$(159
));:FORX=30TO34:FORY=31TO1STEP-1
:SET(X,Y,2):NEXTY,X:PRINT@96,"A
TRAP OPENS ";:PRINT@128,"UNDER Y
OU AND";:PRINT@160,"YOU FALL IN
A";:PRINT@192,"DEEP DARK PIT";
59 FORY=1TO31:SET(32,Y,RND(8)):S
OUNDY*8,2:SET(32,Y,2):NEXT:FORX=
31TO34:SET(X,31,4):NEXT:PRINT@14
6,"YOU ARE THE    ";:PRINT@210,"R
ED BLOB     ";:PRINT:GOSUB3:IFAC
=1THEN243ELSE248
60 GOTO46
61 CX=244:CY=180
```

Hint . . .

More Disk For The Money

Disk drive users can save a great deal of money by double-siding their single-sided disks. This can be accomplished by notching the left corner, as is the right, with a sharp razor (and ruler for accuracy). Then (using a ruler again), a hole must be punched opposite the hole already in the disk jacket. Both sides must be done, taking extreme care not to scratch the disk surface. (The jacket may be pulled away from the disk surface far enough to facilitate punching.) A standard hole punch does the job nicely. This hole punch is necessary due to the LED inside the drive which begins reading/writing after touching off a photo-circuit on the opposite side of the disk through the hole.

Dave Raun
Jacksonville, IL

```
62 POKE32766,7:AH=RND(5)-1:SCREE
N1,0:PCLS3:FORW=1TO8:X=RND(18)+1
62:Y=RND(42)+58:PSET(X,Y,2):NEXT
:LINE(220,108)-(228,116),PRESET,
BF
63 COLOR4,3:FORX=0TO1:FORY=0TO1:
LINE(162+12*X,58+22*Y)-(162+12*(
X+1),58+22*(Y+1)),PSET,B:NEXTY,X
:FORY=60TO84STEP24:NEXT:COLOR2,1
:LINE(223,110)-(224,111),PSET,BF
:GET(CX,CY)-(CX+3,CY+3),M
64 GOSUB4
65 IFPEEK(65280)=126ORPEEK(65280
)=254THEN66ELSEGOTO64
66 IFCX>160ANDCX<189ANDCY>54ANDC
Y<102THENCLS3:PRINT@166,"NICE WE
ATHER OUTSIDE";:PRINT@225,"THE F
ULL MOON GIVES A STRANGE";:PRINT
@259,"LOOK TO ALMOST EVERYTHING"
;:GOSUB3:SCREEN1,0:GOTO64
67 IFCX>218ANDCX<230ANDCY>106AND
CY<114THENIFA6=1THENA6=0:GOTO62E
LSE69
68 IFA6=1THEN78ELSE64
69 A6=1:LINE(0,56)-(136,100),PSE
T,BF:FORX=12TO108STEP24:LINE(X,6
4)-(X+20,92),PRESET,BF:CIRCLE(X+
5,84),3,2:NEXT
70 LINE(0,164)-(255,191),PRESET,
BF:LINE(0,163)-(100,128),PSET,BF
:FORX=4TO76STEP24:LINE(X,136)-(X
+20,162),PRESET,BF:CIRCLE(X+4,14
4),3,2:NEXT
71 COLOR4,1:FORY=1TO3:LINE(4,102
+Y)-(100,102+Y),PSET:LINE(4,114+
Y)-(100,114+Y),PSET:NEXT:FORX=14
TO86STEP12:FORY=1TO3:LINE(X+Y,10
4)-(X+Y,116),PSET:IFX=14ORX=50OR
X=86THENLINE(X+Y+7,102)-(X+Y+7,1
06),PRESET:NEXTY,X ELSENEXTY,X
72 IFAG=1THEN78ELSEFORX=86TO198S
TEP28:IFX=86ORX=170ORX=198THENCI
RCLE(X,166),14,3:PAINT(X,176),3,
3:CIRCLE(X,166),7,2:PAINT(X,166)
,2,2:A$="BM"+STR$(X):DRAWA$+",16
6C3NU7ND7NE7NF7NG7NH7NR7L7":NEXT
ELSENEXT
73 COLOR2,1:FORX=0TO1:LINE(163+X
,58+X)-(188-X,101-X),PSET,B:LINE
(175+X,58)-(175+X,101),PSET:LINE
(163,79+X)-(188,79+X),PSET,B:NEX
T:LINE(159,100)-(192,104),PSET,B
F
74 DRAW"BM24,168C4R44BR36R48BR64
R12BM24,152M92,128NM108,108R8BE8
U12R60BM182,114L34ND14BL8ND14L26
D14R26BR8R54BM222,152R6D10BL30BU
4L28
```

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75 CIRCLE(32,175),24,4,1,.63,.7:
CIRCLE(24,144),16,4,1,.05,.3:CIR
CLE(36,144),28,4,1,.32,.4:CIRCLE
(100,120),8,4,1,0,.25:CIRCLE(86,
180),22,4,1,.6,.9:CIRCLE(170,180
),22,4,1,.6,.75:CIRCLE(198,180),
22,4,1,.75,.9 :CIRCLE(145,255),8
8,4,1,.81,.96
76 PAINT(24,164),4,4:PAINT(24,15
6),2,4:COLOR2,1:LINE(114,113)-(1
41,129),PSET,B:DRAW"BM179,113C2L
33D16R58":PAINT(226,154),4,4
77 CIRCLE(64,168),20,3,1,.5,.75:
CIRCLE(64,168),24,3,1,.5,.75:DRA
W"BM40,168C3R4BM64,148R158H4L152
":PAINT(210,145),3,3:CIRCLE(145,
255),88,4,1,.81,.96:PAINT(44,165
),3,3:DRAW"BM110,168U58R34D58":C
L=RND(5):DRAW"BM114,138C2R8D1L8D
1R8"
78 IFCX<125ANDCX>111ANDCY>134AND
CY<142THEN79ELSEGOTO80
79 IFA7=1ANDAG=0THEN89ELSECLS7:P
RINT@230,"THIS DOOR IS LOCKED";:
GOSUB2:SCREEN1,0
80 FORX=14TO110STEP24:IFCX>=X AN
DCX<X+8ANDCY<87ANDCY>79THENPAINT
(CX+9,CY),3,2:CIRCLE(X+3,84),3,3
:GET(CX,CY-4)-(CX+3,CY-1),M:GOTO
81ELSENEXT:GOTO64
81 X=12+24*AH:IFA7=0ORAG=1THEN82
ELSEGOTO64
82 IFCX>X ANDCX<X+18THEN83ELSEGO
TO64
83 IFAR=0ANDAG=1THENGOTO88ELSEIF
AR=0THENFORW=X+4TOX+16STEP4:FORY
=68TO88STEP4:PSET(W,Y,RND(2)*2):
NEXTY,W:GOSUB2:CLS3:PRINT@96,"TH
ERE IS A PANEL FILLED WITH REDAN
D YELLOW KEYS":PRINT"DO YOU WANT
 A KEY (Y/N)";ELSEGOTO64
84 INPUTA$:IFA$="Y"THEN85ELSESCR
EEN1,0:GOTO64
85 PRINT@327,"WHAT COLOR (Y/R)";
:INPUTZ$:A7=1:IFZ$="R"THENCLS:A6
=0:FORY=1TO10:PRINT@234,"***ALAR
M***":FORW=1TO200STEP25:SOUNDW,1
:NEXTW:PRINT@234,"***alarm***":N
EXTY:CLS:PRINT"THE INVISIBLE DOG
 COMES AND EATSYOU.":IFAC=1THEN2
43ELSEGOTO248
86 IFZ$<>"Y"THEN85
87 SCREEN1,0:GOTO64
88 CLS:X=RND(2000):PRINT:PRINT"Y
OU FIND"X"GOLD COINS":G=G+X:GOSU
B241:AR=1:GOTO64
89 IFPEEK(32767)<>7THENA5=1:AUDI
OON:MOTORONELSEA5=1
90 AU=0:A7=0:A8=1:C5=0:C8=0:PX=1
04:PY=161:TX=156:T=0
91 IFC8=0THENZ1=3:Z2=2:GOTO94ELS
EZ1=2:Z2=3:IFTX>92THENCLS:PRINT:
PRINT"YOU FORGOT TO TURN THE MOT
OR OFFWHEN YOU LEFT THE CAR.  YO
U ARE LUCKY THERE IS SOME GAS LE
FT. BECAREFUL NEXT TIME":GOSUB3:
GOTO94ELSEGOTO92
92 CLS:PRINT:PRINT"YOU LEFT THE
CAR WITHOUT TURNINGTHE MOTOR OFF
. IT RAN OUT       OF GAS
   ":PRINT:PRINT"the game is ove
r":GOTO249
93 IFC8=1THENZ1=2:Z2=3
94 A6=0:PCLS1:SCREEN1,0:AE=0:DRA
W"BM24,24C3M0,108R255M232,24BM20
8,0L160":CIRCLE(52,27),28,3,1,.5
2,.73:CIRCLE(204,27),28,3,1,.77,
.98:PAINT(0,26),4,3:PAINT(255,26
),4,3
95 A$="R28D20L28U20":DRAW"BM4,12
0"+A$+"BM72,120"+A$+"BM116,120"+
A$+"BM160,120"+A$+"BM224,120"+A$
:COLOR3,2:LINE(92,144)-(168,152)
,PSET,B:LINE(TX,144)-(TX,152),PS
ET:PAINT(166,150),3,3:LINE(100,1
60)-(160,188),PSET,B:LINE(10,164
)-(48,176),PSET,B
96 LINE(208,164)-(228,176),PSET,
B:LINE(230,164)-(250,176),PSET,B
:PAINT(120,1),3,3:PAINT(0,109),4
,3:COLORZ1,Z2:LINE(208,164)-(228
,176),PSET,B:LINE(230,164)-(250,
176),PRESET,B
97 DRAW"BM28,132C3U4L12U4M-8,+6M
+8,+6U4R12BM228,132U4R12U4M+8,+6
M-8,+6U4L12":PAINT(27,129),3,3:P
AINT(230,130),3,3:DRAW"BM80,136U
12R10F2D2G2L10M92,136BR32R10E2U2
H2L8H2U2E2R10BR32R10F2D8G2L10U12
":C$="U4R2F1D2G1L2BR7":A$="BR1H1
U2E1R1F1D2G1L2BR7
98 B$="U4R4D2L4F1M+2,+1R1":DRAW"
BM17,172"+C$+"BR1"+A$+"BL1"+A$+B
$+"S4"
99 AT=1:DRAW"BM213,172S5"+A$+"S4
U4F4NU4BR8"+A$+"BL1U2NR2U2R3BR3N
R3D2NR2D2BM88,152C1L4U4NR4U4R4BM
172,152U4NR4U4R4":IFPEEK(32767)<
>7ANDA5=1ANDAN=0THENFORX=1TO4400
0:NEXT:FORX=1TO25:SOUNDRND(255),
1:NEXT:AN=1:POKE32767,7:AUDIOOFF
:MOTOROFF:GOTO103
100 IFA5=1THEN103
101 DRAW"BM22,32C1R210M255,108BL
255M22,32BM3,96M128,32M253,96":P
AINT(118,35),1,1:PAINT(138,35),1
```

PRO-COLOR-SERIES

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- *60 Data Fields for storing data*
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PRO-COLOR-FILE is also supported by a NATIONAL USERS' group. Their quarterly newsletter is packed with ideas for using PRO-COLOR-FILE to its fullest. A listing of database programs that have already been created is also provided for comparing notes with other users. Useful database information such as magazine articles are available on a data disk for use on your own system.

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This is the second link in the series. PRO-COLOR-FORMS offers the ability to merge data files with text files. Just imagine being able to place the data you enter with PRO-COLOR-FILE anywhere on a sheet of paper, either by itself or within an external source of text, then you'll have the picture. This means you could write a general letter to a list of people but have each one custom printed with their name and address. You can pre-enter checks into a data base and then have the checks printed on form-feed checks. You might even use form-feed statements for sending out to customers at the end of each month. All of the parameters can be modified to indicate just what size "page" you need for any application:

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- *Password protection*

If you need to generate forms from your data files then chances are you can do just that with PRO-COLOR-FORMS. Form letters, billing statements, index cards, or even post cards can be used easily.

PRO-COLOR-DIR** $24.95

The latest addition to the series is a utility for organizing disk directories into one nice listing. PRO-COLOR-DIR reads the directory of a diskette and then stores valuable information about each program into a master data file. This data file can then be accessed by PRO-COLOR-FILE for sorting, searching and reporting. PRO-COLOR-DIR will create a record for each filename on a diskette and store the following information about each one:

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- *Date diskette was created*
- *Last date diskette was updated*
- *Filename and extension*
- *File type (BASIC, ML Text, Data)*
- *Number of Grans allocated*
- *Number of sectors allocated and used*
- *Machine Language program addresses*

PRO-COLOR-DIR allows for hardcopies of a single diskette's files and has a versatile label printing routine. A global replace function can re-store a diskette's files with deleted files being removed or new ones appended automatically.

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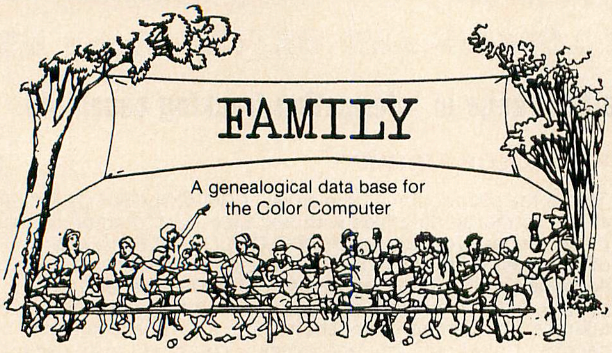
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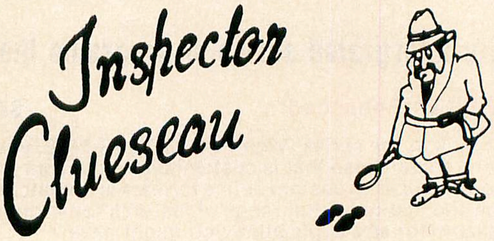

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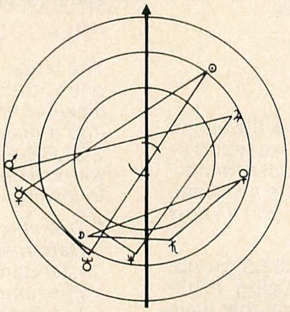

Calculates Equal & Placidian house systems.

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Graphic screen display of chart. Dumps to LPVII/DMP100 printers.

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```
,1:FORW=1TO20:X=RND(208)+24:Y=RN
D(31):IFPPOINT(X,Y)=3THENPSET(X,
Y,2):NEXTELSENEXT
102 COLOR3,2:LINE(122,108)-(128,
32),PRESET:LINE-(134,108),PRESET
:LINE-(122,108),PRESET:PAINT(128
,100),2,2:COLOR4,3:LINE(0,0)-(25
5,191),PSET,B
103 COLOR3,2:SCREEN1,0:AP=1:GOSU
B5:IFTX<92THENCLS:PRINT:PRINT"YO
U RAN OUT OF GAS":PRINT:PRINT"th
e game is over":GOTO249
104 IF(PEEK(65280)=126ORPEEK(652
80)=254)THEN105ELSE122
105 IFCY<176ANDCY>162THEN106ELSE
110
106 IFAQ=1ANDCX>8ANDCX<47THENC6=
1:GOTO232
107 IFCX>206ANDCX<227ANDC8=0THEN
C8=1:LINE(208,164)-(228,176),PRE
SET,B:LINE(230,164)-(250,176),PS
ET,B
108 IFCX>230ANDCX<251ANDC8=1THEN
C8=0:LINE(208,164)-(228,176),PSE
T,B:LINE(230,164)-(250,176),PRES
ET,B:C5=0
109 GOTO103
110 IFC8=0ORAQ=1THEN103
111 IFCX>158ANDCX<187THENC5=1:IF
A5=1THENCLS:AS=1:AU=1:A7=0:AT=0:
A6=0:AG=0:PRINT:PRINT"YOU CRASHE
D INTO THE WALL OF THEGARAGE.":G
OSUB2:IFAC=1THEN243ELSECLS:GOTO2
48
112 IFCX>70ANDCX<99THENC5=0ELSEG
OTO115
113 IFA5=1THENCLS:PRINT:PRINT"YO
U ARE OUT OF THE GARAGE":GOSUB2:
A5=0:GOTO114ELSECLS:PRINT:PRINT"
YOU CAN'T GO BACKWARD ON THE
ROAD.":GOSUB3:SCREEN1,0:GOTO101
114 PRINT:PRINT"THE CAR IS PROGR
AMMED TO GET YOUOUT OF TOWN AUTO
MATICALLY. IT   THEN STOPS AND W
AITS FOR YOUR   INSTRUCTIONS.":G
OSUB3:GOSUB2:SCREEN1,0:GOTO101
115 IFCX<144ANDCX>114THENC5=0
116 IFC5=0THEN103
117 IFCX<31ANDCX>2ANDC5=1ANDC8=1
THENC1=1ELSEIFCX>222ANDCX<251AND
C5=1ANDC8=1THENC2=1
118 IFC1=1THENIFAA=1THENR=RG:GOT
O130ELSEIFC1=1ANDC5=1THEN121
119 IFC2=1THENIFAB=1THENR=RD:GOT
O130ELSEIFC2=1ANDC5=1THEN121
120 GOTO123
121 FORX=1TO10:SCREEN1,1:SOUND1,
2:SCREEN1,0:SOUND200,2:NEXT:CLS:
PRINT:PRINT"YOU TURNED WHEN THER
E WAS NO    SIDE ROAD SO YOU ENT
ERED THE    FIELDS AT HIGH SPEED
 AND LOST   CONTROL OF THE CAR":
AS=1:C1=0:C2=0:AU=1:A7=0:AT=0:A6
=0:AG=0:GOTO243
122 IFC5=0ORAQ=1THEN103
123 T=T+2:COLOR3,1:IFAB=1THENLIN
E(SD,YD)-(XD,YD),PRESET:SD=SD+.5
:XD=XD+4:YD=YD+2:IFXD>250THENPUT
(235,4)-(252,20),C:AB=0ELSELINE(
SD,YD)-(XD,YD),PSET:GOTO125
124 X=RND(20):IFX=10THENX=RND(10
):IFX=RG THEN125ELSEGOSUB229:DRA
W"BM235,20C2"+L$:RD=X:AB=1:XD=12
8:YD=32:SD=233
125 COLOR3,1:IFAA=1THENLINE(SG,Y
G)-(XG,YG),PRESET:SG=SG-.5:XG=XG
-4:YG=YG+2:IFXG<4THENPUT(4,4)-(2
0,20),C:AA=0ELSELINE(SG,YG)-(XG,
YG),PSET:GOTO127
126 X=RND(20):IFX=10THENX=RND(10
):IFX=RD THEN127ELSEGOSUB229:DRA
W"BM4,20C2"+L$:RG=X:AA=1:XG=128:
YG=32:SG=22
127 PUT(PX,PY)-(PX+3,PY+3),A1:PX
=PX+4:IFPX>157THENPX=104:PY=PY+4
:IFPY>184THENPY=161
128 PUT(PX,PY)-(PX+3,PY+3),A2
129 GOTO103
130 GOTO232
131 SCREEN1,1:PCLS5:CIRCLE(128,9
6),125,6,.75:PAINT(0,0),6,6:COLO
R6,7:LINE(0,176)-(255,176),PSET,
BF:PAINT(128,177),6,6:LINE(32,16
8)-(224,175),PRESET,BF
132 BR$="BE4E12F4G16U7"
133 DRAW"BM40,168S4C8U132BE12R52
BF12D132L74BM60,34R32BD24L32":CI
RCLE(50,35),12,8,1,.5,.75:CIRCLE
(106,35),12,8,1,.75,1:CIRCLE(60,
46),12,8,1,.25,.75:CIRCLE(92,46)
,12,8,1,.75,.25:PAINT(41,167),8,
8:LINE(60,40)-(92,44),PSET,BF:PA
INT(44,167),8,8
134 LINE(60,48)-(92,52),PRESET,B
F:DRAW"BM112,60C7"+BR$:PAINT(120
,56),7,7:LINE(48,72)-(104,148),P
SET,BF:DRAW"BM104,148C5L56M76,72
M104,148":PAINT(76,76),5,5:CIRCL
E(76,130),14,7:PAINT(76,130),7,7
135 CX=126:CY=182:GET(CX,CY)-(CX
+3,CY+3),M:AD=RND(2):IFAD=1THEND
RAW"BM132,167C8S7"+BO$+"S4":PAIN
T(136,163),8,8:PAINT(187,122),7,
8
136 IFOW=0THEN138ELSECLS:PRINT:P
RINT"YOU OWE"OW"COINS":PRINT:IFO
W<G THENG=G-OW:OW=0:PRINTTAB(8)"
THANK YOU!":GOSUB3:SCREEN1,1:GOT
```

```
0138
137 PRINT"YOU DO NOT HAVE ENOUGH
 MONEY TO PAY YOUR DEBT. WE TAKE
 WHAT YOU HAVE AND YOU WILL HAVE
 TO COME  BACK TO GET GAS.":OW=O
W-G:G=0:GOSUB3:GOSUB2:GOTO131
138 GOSUB4:SCREEN1,1:IFPEEK(6528
0)=126ORPEEK(65280)=254THEN139EL
SEGOTO138
139 IFCX>120ANDCX<130ANDCY>41AND
CY<56THENPUT(CX,CY)-(CX+3,CY+3),
M:DRAW"BM112,60S4C5"+BR$:PAINT(1
20,56),5,5:DRAW"BM112,60A1C7"+BR
$:PAINT(120,69),7,7:FORX=1TO25:S
OUND240,1:SOUND255,2:NEXT:CLS8:P
RINT@229,"YOUR TANK IS NOW FULL"
;:ELSE142
140 W=166-TX:TX=166:PRINT@288,W"
LITERS * 15 COINS/LITER":PRINT"T
OTAL COST:"W*15"COINS":GOSUB3:IF
G-W*15<0THENPRINT@384,"YOU HAVE
ONLY"G"COINS, SO YOU   OWE"ABS(G
-W*15)"COINS":OW=ABS(G-W*15):G=0
:GOSUB3:ELSEG=G-W*15:GOTO141
141 SCREEN1,1:DRAW"BM112,60C5"+B
R$:PAINT(120,69),5,5:DRAW"BM112,
60A0C7"+BR$:PAINT(120,56),7,7:CO
LOR8,6:LINE(116,52)-(116,78),PSE
T:PAINT(114,64),8,8
142 IFAD=1ANDCX>134ANDPPOINT(CX-
1,CY-1)=8ANDPPOINT(CX+4,CY+4)=8T
HENGOSUB237:SCREEN1,1:GOTO138ELS
E138
143 R=RND(4):PCLSR:SCREEN1,0:CX=
128:CY=96
144 V=RND(4):IFV=R THEN144ELSECO
LORV,R:LINE(0,0)-(3,3),PSET,BF:G
ET(0,0)-(3,3),D
145 Z=RND(4):IFZ=R ORZ=V THEN145
ELSEPAINT(1,1),Z,R:GET(0,0)-(3,3
),E
146 FORX=0TO255STEP8:FORY=0TO188
STEP8:IFINT(Y/8)-Y/8=0THENPUT(X,
Y)-(X+3,Y+3),D:NEXTY,X
147 W=RND(4):IFW=R ORW=V ORW=Z T
HEN147ELSEFORZ=1TO5:X=RND(215)+2
0:Y=RND(151)+20:CIRCLE(X,Y),20,W
:PAINT(X,Y),W,W:SOUND200,3:NEXT
148 CX=RND(251):CY=RND(187):IFPP
OINT(CX-1,CY-1)=W ORPPOINT(CX+4,
CY+4)=W THEN148ELSEGET(CX,CY)-(C
X+3,CY+3),M
149 X=RND(249)+1:Y=RND(185)+1:GE
T(X,Y)-(X+3,Y+3),F:PUT(X,Y)-(X+3
,Y+3),E:ZZ=RND(28):FORV=1TOZZ:GO
SUB4:IFPPOINT(CX-1,CY-1)=W ORPPO
INT(CX+4,CY+4)=W THENGOSUB2:CLS:
GOTO243ELSEIFCX<X+4ANDCX>X-4ANDC
```

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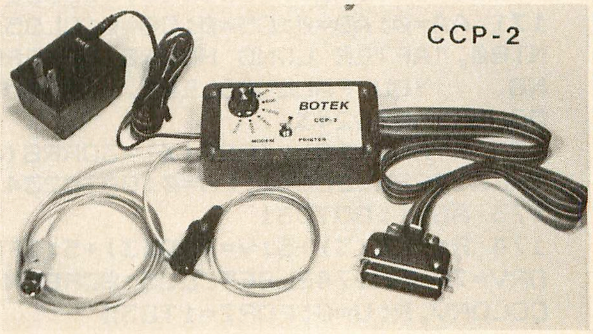
```
Y<Y+4ANDCY>Y-4THEN151ELSENEXT:PU
T(X,Y)-(X+3,Y+3),F
150 IFAF=1THENAF=0:SCREEN1,0:GOT
O149ELSEAF=1:SCREEN1,1:GOTO149
151 PCLS6:SOUND132,16:DRAW"BM160
,64C7"+BO$:PAINT(162,25),7,7:PAI
NT(162,62),8,7:SCREEN1,0
152 GOSUB4:IFPPOINT(CX-1,CY-1)=3
ANDPPOINT(CX+4,CY+4)=3AND(PEEK(6
5280)=126ORPEEK(65280)=254)THENG
OSUB237ELSE152
153 GOSUB4:GOTO153
154 PCLS5:R=RND(3)+5:SCREEN1,1
155 V=RND(3)+5:IFV=R THEN155ELSE
FORZ=1TO29:W=RND(15)+10:X=RND(25
5):Y=RND(191):SOUND1,1:CIRCLE(X,
Y),W,V:PAINT(X,Y),V,V:NEXT:X=RND
(232)+10:Y=RND(168)+10:CIRCLE(X,
Y),15,R:PAINT(X,Y),R,R
156 X$=STR$(X-6):Y$=STR$(Y+6):DR
AW"BM"+X$+","+Y$+"S1C5"+BO$+"S4"
:PAINT(X-4,Y+4),R,5
157 CX=RND(251)+1:CY=RND(187)+1:
IFPPOINT(CX-1,CY-1)=V OR PPOINT(
CX+3,CY+3)=V THEN 157 ELSEGET(CX
,CY)-(CX+3,CY+3),M:PUT(CX,CY)-(C
X+3,CY+3),A1
158 GOSUB4:PUT(1,1)-(4,4),M:IFPP
OINT(1,1)=V OR PPOINT(4,4)=V THE
NGOSUB2:CLS:GOTO243ELSEIFPPOINT(
CX-1,CY-1)=R OR PPOINT(CX+4,CY+4
)=R THENGOSUB2:GOSUB237:GOTO158E
LSE158
159 CLS3:IFAV<>1THENPRINT@192,"
IT IS NOT POSSIBLE TO TURN ON
THAT ROAD, A POLICEMAN ASK YOU
TO GO BACK ON THE MAIN ROAD.":AV
=AV+1:GOSUB3:C1=0:C2=0:SCREEN1,0
:GOTO103ELSE234
160 AV=AV+1:CLS:PRINT:PRINT"THE
POLICEMAN HAS FALLEN ASLEEP.DO Y
OU WANT TO GO ON (Y/N)";:INPUTA$
:IFA$="Y"THEN161ELSEIFA$="N"THEN
94ELSE160
161 X=RND(3):IFX=2THEN163ELSECLS
:PRINT"YOU GO ON THE ROAD FOR A
WHILE. SUDDENLY, YOU HEAR A STRA
NGE     NOISE.":FORX=255TO150STEP
-1:SOUNDX,1:NEXT:CLS5:SOUND1,19:
CLS:PRINT"SOMETHING HITTED YOUR
CAR WHICH EXPLODED. YOU ARE BADL
Y INJURED.
162 AU=1:PRINT"THIS IS A TESTING
 GROUND FOR NEWWEAPONS.":GOSUB3:
GOTO243
163 X=RND(10000):CLS:PRINT"YOU C
OME TO THE SCENE OF AN     ACCID
ENT WHICH SEEMS TO HAVE     TAKEN
```

PARALLEL PRINTER INTERFACE

FOR THE RADIO SHACK COLOR COMPUTER

- Runs any parallel printer from the Color Computer serial I/O port.
- No hardware modifications or software patches needed. Works with all standard Color Computer commands including graphics.
- Switch selectable baud rates from 300 to 9600.
- All cables and connectors included.
- 1 year warranty.
- Most printers supply power at the parallel port. With these printers you may order your interface without the power module.
  (Printers known to require the power module are: Epson, Panasonic, and Mannesman Tally.)
- PRICE: Model CCP-2 with modem connector & switch------ $84.
  Model CCP-1 without modem connector & switch----$69.
  Either model without power module deduct--------- $3.
  Shipping costs included in price.
  Michigan residents add 4% sales tax.



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```
 PLACE ABOUT AN HOUR AGO. ACAR I
S STILL BURNING. NEAR IT ANARMY
TRUCK IS LYING ON ONE SIDE,DOORS
 OPEN. IT IS FILLED WITH   BAGS.
":G=G+X:Z1=2:Z2=3:AA=0:AB
164 PRINT"A FEW SOLDIERS ARE AWA
Y IN THE  FIELDS, LOOKING ON THE
 GROUND ATSOMETHING YOU DO NOT S
EE. YOU  GRAB ONE OF THE BAGS A
ND GO AWAYWITH IT. WHILE DRIVING
 BACK TO  THE MAIN ROAD, YOU OPE
N IT AND  FINDS THAT IT CONTAINS
"X:PRINT@448,"GOLD COINS:
165 PRINT@480,"PRESS <ENTER> TO
GO ON.";:IFINKEY$=""THEN165ELSEC
LS:GOSUB241:GOTO94
166 CLS5:PRINT@448,"IT IS SNOWIN
G SO MUCH THAT YOU  CAN'T SEE.":
GOSUB3
167 IFS=0THENPRINT"DO YOU WANT T
O (1)-COME BACK ON THE MAIN ROAD
  (2)-STAY ON THIS ROAD";:INPUTX
:IFX=1THENAA=0:AB=0:C1=0:C2=0:C5
=1:GOTO93ELSEIFX<>2THEN167
168 CLS5:PRINT@416,"THE CAR IS S
TUCK IN THE SNOW ANDCANNOT MOVE
ANYMORE. DO YOU WANTTO USE A BAG
 OF SALT TO MELT THESNOW AND FRE
E YOU (Y/N)";:INPUTA$:IFA$="Y"TH
EN169ELSEIFA$="N"THEN171
169 IFS>0THENS=S-1:PRINT"IT WORK
ED, YOU ARE NOW MOVING":GOSUB3:G
OTO172
170 PRINT:PRINT"YOU DO NOT HAVE
A BAG OF SALT":GOSUB3:GOSUB241
171 AA=0:AB=0:C5=0:C8=0:CLS5:PRI
NT@0,"AFTER LONG HOURS OF FREEZI
NG,   YOU FALL ASLEEP.":GOSUB3:G
OSUB3:GOTO243
172 X=RND(10):IFRS(X)=3ORRS(X)=6
THEN172ELSEC6=1:C8=0:GOTO234
173 AG=1:GOTO31
174 R=RND(3)+5:V=RND(3)+5:IFV=R
ORV=7THEN174ELSEPCLS5:SCREEN1,1:
COLORV,R:U=0:FORZ=1TO35
175 X=RND(252):Y=RND(188):W=RND(
100)+Y:IFW>188OR(X>234AND Y<16)T
HEN175ELSELINE(X,Y)-(X+4,W),PSET
,BF:NEXT:FORZ=1TO25
176 Y=RND(187):X=RND(245):IFX>23
4OR Y<16THEN176ELSELINE(X,Y)-(X+
10,Y+4),PSET,BF:NEXT:W=0
177 W=W+1:IFW=V ORW=R THEN177ELS
ECOLORW,R:DRAW"BM240,16C7S1"+BO$
+"S4":PAINT(250,6),8,7:PAINT(242
,14),7,7:CX=4:CY=185:GET(CX,CY)-
(CX+3,CY+3),M:TIMER=0
178 PUT(CX,CY)-(CX+3,CY+3),M:SX=
CX:TY=CY:GET(SX,TY)-(SX+3,TY+3),
D:GOSUB4:IFPPOINT(CX-1,CY-1)=V O
R PPOINT(CX+4,CY+4)=V THENPUT(CX
,CY)-(CX+3,CY+3),M:PUT(SX,TY)-(S
X+3,TY+3),D:CX=SX:CY=TY:GET(CX,C
Y)-(CX+3,CY+3),M:PUT(CX,CY)-(CX+
3,CY+3),A2
179 IFTIMER>1200THENLINE(U,0)-(U
,191),PRESET:U=U+4:IFCX+4<U ORU>
252THENGOSUB2:CLS:GOTO243ELSEIFU
>128THENU=U+2
180 IFCX>236ANDCY<16AND(PEEK(652
80)=126ORPEEK(65280)=254)THENGOS
UB237
181 GOTO178
182 PCLS4:SCREEN1,0:DRAW"BM240,1
6C3S1"+BO$+"S4":PAINT(250,6),3,3
:PAINT(242,14),1,3:CX=1:CY=188:G
ET(CX,CY)-(CX+3,CY+3),M:COLOR2,1
183 GOSUB4
184 X=RND(255):Y=RND(191):W=RND(
255):Z=RND(191):IF(X>236ANDY<16)
OR(W>236ANDZ<16)THEN184ELSELINE(
X,Y)-(W,Z),PSET:SOUNDRND(255),2
185 IFCX>236ANDCY<16THEN189
186 FORU=CX TOCX+3:FORV=CY TOCY+
3:IFPPOINT(U,V)=2THENGOSUB2:SCRE
EN0,0:FORUE=0TO9:CLS(UE):SOUNDRN
D(255),2:NEXT:GOTO188
187 NEXTV,U:GOTO189
188 CLS:PRINT:PRINT"YOU HAVE BEE
N HIT.  YOU ARE VERYWEAK AND UNA
BLE TO GO ON.":GOSUB2:GOTO243
189 IFPEEK(65280)=126ORPEEK(6528
0)=254THENGOSUB237:GOTO183ELSE18
3
190 CLS:PLAY"EEEC":FORX=0TO351:P
RINT@X,CHR$(RND(117)+128):NEXT:I
FAM=0THENAL=RND(5000)+5000:AM=1
191 IFC8=1THENTX=TX-3
192 PRINT@352,"YOU HAVE FOUND US
. DO YOU HAVE  "AL"GOLD COINS, T
HE ELIXIR ANDTHE BAG OF SALT?
193 A$=INKEY$:X=RND(351):PRINT@X
,CHR$(RND(117)+128);:IFA$="N"THE
N206ELSEIFA$="Y"THEN194ELSE193
194 PRINT@352,"":IFG>=AL ANDS>=1
THENIFB>=1THEN200ELSEIFBP>=1THEN
199
195 PRINT@384,"YOU ARE A LIAR. Y
OU DO NOT HAVE ENOUGH";:IFG<AL T
HENPRINTTAB(11)"GOLD
196 IFB=0THENPRINTTAB(11)"ELIXIR
197 IFS<1THENPRINTTAB(11)"SALT
198 GOSUB3:CLS:GOSUB241:GOTO91
199 PRINT@352,"THE BOTTLE YOU HA
VE CONTAINS A  GREEN LIQUID WHIC
H IS POISON.  YOU WANTED TO KIL
```

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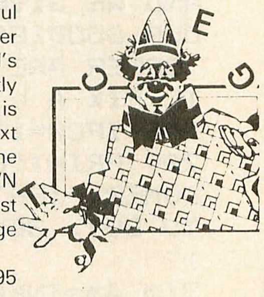


In the ABC program, all 26 letters spring up in color to the familiar ABC tune. Then, colorful detailed pictures depicting each individual letter of the alphabet appear one by one. Your child's fascination will mount as he or she correctly presses the letter on the keyboard and is rewarded with a musical tune before the next detailed picture is drawn line by line onto the screen: AIRPLANE for A, BUS for B, CLOWN for C and so on to ZEBRA for Z. Truly a must program for the preschool to first grade age group!

CoCo 16K ECB . . . . . . Tape: $19.95 Disk: $25.95

CRISS—CROSS MATH

As the program begins, your child is presented with a nine square playing board. It is your choice as to which square you choose. After a choice is made, a MATH PROBLEM appears in the square. You score your first X by answering the problem correctly. If your answer is incorrect, the square clears and your opponent is allowed his choice of squares. The game is over when three squares vertically, horizontally, or diagonally are won by the same player. When playing against the computer, every answer you get wrong is won by the computer. Multi-level ADDITION AND SUBTRACTION program.

CoCo16K . . . . Tape: $12.95

FRACTIONS

SIDE ONE: Fraction Lessons, explains fractions with the aid of graphics. Child studies the different ways fractions can be represented. Lessons include:

- IMPROPER FRACTIONS
- MIXED FRACTIONS
- PROPER FRACTIONS

Many educators have praised the use of motion and color to display the fractional equivalents.

SIDE TWO: Fraction practice, offers a random computer generated quiz.

Atari16k . . . . Tape: $19.95
CoCo16k . . . . Tape: $19.95

JOYSTICK DRAW

Joystick Draw is the simple way to explore your artistic talents! Program operation is easy enough for a child to use, but effective enough that TCE uses it to design many sophisticated high-resolution graphic screens. Joystick Draw's design allows you or your child to save those masterpieces for future revisions or for use in other programs (instructions included). Your child will spend many hours enjoying this program and at the same time improving his or her eye hand coordination! You will find Joystick Draw to be an easy way to design those more sophisticated graphics for your own programs!

CoCo16 ECB . . . . Tape: $16.95

SPELL BOMBER

As captain of your ship, you must destroy the enemy bomber by spelling the mystery word. In this exciting and educational game the bomber gets closer with each inaccurate letter. You have only EIGHT tries to guess the mystery word or your ship will be bombed! If you guess the word correctly, GENERAL QUARTERS will sound and your ship will fire a missile to destroy the bomber, Three levels are available: EASY, MEDIUM, and HARD. Challenging for all ages!

Atari16K . . . . Tape: $18.95
CoCo 16k ECB . . . . Tape: $18.95 Disk: $22.95
Vic 20 13k . . . . Tape: $18.95

SPELLING BEE

The word is pronounced vocally and it is up to you to type in the correct spelling. If wrong, the computer will be your friend and flash the word on the screen for just an instant. OK! Try typing the word in again. STILL WRONG! The computer wants success and allows you to see the word again this time a little longer. If you just can't spell the word, the computer realizes you need to learn to spell the word and leaves the word on the screen for you to copy. Try your best and the computer has a surprise for your reward!

SPELLING BEE I . . . GRADE 1 & 2 SPELLING BEE III . . . GRADE 5 & 6
SPELLING BEE II . . GRADE 3 & 4 SPELLING BEE IV . . . GRADE 7 & 8

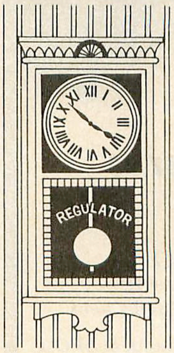
CoCo 16k ECB . . . . TAPE: $16.95 Each

TC—INVENTORY

Many insurance companies offer a discount for policy holders which have complete inventories on file. TC — Inventory is designed to help you organize, maintain, and compile the personal belongings of your home. Program is user friendly and menu driven. TC — Inventory allows input for location of item, price of item, serial number of item, date of purchase, and a text written description of the item. Don't put off recording your personal belongings until its too late. Requires printer for hard copy.

CoCo 32k ECB . . . . Tape: $16.95

TEACHING CLOCK



Torn between teaching time on a digital or a conventional (face and hands) clock? Well, this program combines the two using high resolution graphics and prompts! Your child will learn to tell time with the aid of a specially designed CLOCK! Child enters the time, if wrong, the center of the clock displays a graphic aid. If the child is correct a musical reward is heard. Program offers three levels: hours, quarter hours, and five minute intervals.

Apple 48k . . . . Disk: $19.95
Atari 32k . . . . Tape: $16.95
CoCo 16k ECB . . . . Disk: $19.95 Tape: $16.95

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```
L US. YOU WILL DIE":GOSUB3:FORX=
352TO510:PRINT@X,CHR$(RND(117)+1
28);:NEXT:PLAY"L3O1EEEL1CP2L3O1A
AAL1F":GOTO248
200 PRINT@384,"THERE IS ONE MORE
 THING YOU MUSTDO BEFORE WE GIVE
 YOU BACK YOUR FRIEND:  you must
 drink poison! ARE YOU READY TO
DO SO?
201 A$=INKEY$:X=RND(351):PRINT@X
,CHR$(RND(117)+128);:IFA$="N"THE
N202ELSEIFA$="Y"THEN203ELSE201
202 PRINT@352,"":PRINT"TOO BAD F
OR YOU!  WE KEEP YOUR  FRIEND. T
HANK YOU FOR THE        GOODIES."
:GOSUB3:GOSUB3:CLS:GOTO249
203 IFAC=1ANDBP>=1THENCLS:PRINT:
PRINT"THE ELIXIR YOU DRANK SOONE
R      PROTECTS YOU AND YOU DO NO
T DIE WHEN YOU DRINK THE POISON.
       YOUR FRIEND JOE IS FREE AN
D YOU GO AWAY WITH HIM.":PRINT:P
RINT"congratulations! YOU'VE MAD
E IT":GOTO249
204 IFBP>=1THENCLS:PRINT:PRINT"Y
OU DRINK THE POISON AND YOU DIE"
:GOTO249
205 PRINT@352,"":PRINT"YOU DO NO
T HAVE ANY POISON.      COME BACK
 WHEN YOU'LL HAVE SOME.":GOSUB3:
GOTO91
206 PRINT@352,"":PRINT"THEN GO A
ND TRY TO FIND WHAT     YOU NEED.
":GOSUB3:GOTO91
207 AT=1:CLS:PRINT"*****main roa
d general store****":PRINT"WE SE
LL AND BUY. WE HAVE THE     LOWES
T PRICES THIS SIDE OF THE  ROAD
AND WE GIVE THE BEST MONEY FOR Y
OUR GOODIES.":PRINT"THE DEALS WE
 OFFER ARE SO GOOD  THAT WE HAD
TO FIX A LIMIT OF
208 IFC8=1THENTX=TX-3
209 PRINT"ONE TRANSACTION BY CUS
TOMER.":PRINT:PRINT"DO YOU WANT
TO BUY, SELL OR      LEAVE (B/S/L
)?
210 A$=INKEY$:IFA$="S"THEN211ELS
EIFA$="B"THEN222ELSEIFA$="L"THEN
91ELSE210
211 X=RND(4):IFX=1THENZ=S:A$="BA
GS OF SALT"ELSEIFX=2THENZ=BP:A$=
"BOTTLES OF POISON":ELSEIFX=3THE
NZ=B:A$="BOTTLES OF ELIXIR OF LO
NG LIFE"ELSEA$="EMPTY BOTTLES":Z
=B
212 Y=RND(500):IFX=1THENY=RND(25
0)ELSEIFX=4THENY=RND(50)
213 CLS:PRINT:PRINT"WE WOULD BE
INTERESTED IN BUYING":PRINTA$:PR
INT"AND WILL PAY"Y"GOLD COINS":G
OSUB241:IFZ=0THENPRINT:PRINT"WE
SEE THAT YOU HAVE NONE AND   NOT
HING ELSE INTERESTS US."ELSE216
214 PRINT"MAYBE YOU WOULD LIKE T
O BUY      SOMETHING (Y/N)?"
215 A$=INKEY$:IFA$="Y"THEN222ELS
EIFA$="N"THEN219ELSE215
216 PRINT:PRINT"HOW MANY DO YOU
WANT TO SELL";:INPUTW:IFW>Z THEN
GOSUB241:CLS:PRINT"YOU DO NOT HA
VE"W:GOTO216
217 IFW=0THEN214ELSEG=G+W*Y:IFX=
1THENS=S-W ELSEIFX=2THENBP=BP-W
ELSEIFX=3THENB=B-W ELSEBV=BV-W
218 CLS:PRINT:PRINT"IT'S A DEAL"
:GOSUB241:PRINT
219 AT=0:CLS:PRINT"IT'S CLOSING
TIME NOW, YOU HAVE TO LEAVE.":GO
SUB3:GOTO91
220 PRINTTAB(5)"ARE YOU INTEREST
ED (Y/N)?"
221 A$=INKEY$:IFA$=""THEN221ELSE
IFA$="Y"AND(G-Y)<0THENCLS:PRINT:
PRINT:PRINT"YOU DO NOT HAVE THE"
Y"COINS":GOSUB3:A$="":RETURNELSE
```

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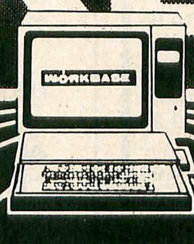
```
RETURN
222 CLS:PRINT"**** ON SALE TODAY
 ****":PRINT:Y=RND(1500)+500:IFR
ND(2)-1THENPRINT"1 BOTTLE OF ELI
XIR:"Y"GOLD":PRINT"COINS":GOSUB2
20:IFA$="Y"THENG=G-Y:B=B+1:GOTO2
18
223 IFRND(2)=1THENY=RND(1000)+50
0:PRINT"1 BOTTLE OF POISON:"Y"GO
LD":PRINT"COINS":GOSUB220:IFA$="
Y"THENG=G-Y:BP=BP+1:GOTO218
224 IFRND(2)=2THENY=RND(500)+100
:PRINT"1 BAG OF SALT:"Y"GOLD":PR
INT"COINS":GOSUB220:IFA$="Y"THEN
G=G-Y:S=S+1:GOTO218
225 IFRND(2)=1THENY=RND(2000)+50
0:PRINT"1 SURPRISE BOX:"Y"GOLD":
PRINT"COINS":GOSUB220:IFA$="Y"TH
ENG=G-Y:GOTO227
226 GOTO219
227 X=RND(4):Y=RND(4):Z=RND(4):I
FX=Y ORZ=X ORZ=Y THEN227ELSEPCLS
X:SCREEN1,0:COLORY,Z:DRAW"BM100,
95S8"+BO$+"S4":PAINT(178,27),Z,Y
:PAINT(102,90),Y,Y:GOSUB2
228 W=RND(2):FORZ=1TOW:AE=0:GOSU
B237:NEXT:GOTO219
229 IFX=1THENL$="BR6U16"ELSEIFX=
2THENL$="NR16U4E4R12U4H4L12D2"EL
SEIFX=3THENL$="R16U8NL8U8L16"ELS
EIFX=4THENL$="BR12U16G12R16"ELSE
IFX=5THENL$="BU4F4R10E2U4H2L14U8
R16
230 IFX=6THENL$="R16U8L16D8U16R1
6D2"ELSEIFX=7THENL$="E16L16"ELSE
IFX=8THENL$="R16U16L16D16U8R16"E
LSEIFX=9THENL$="NU2R16U16L16D8R1
6"ELSEIFX=10THENL$="U16BR4D16R8U
16L8
231 RETURN
232 FORX=1TO10:IFR(X)=R THEN233E
LSENEXT
233 IFRS(X)<>6ANDRS(X)<>3THENPAI
NT(126,2),4,4ELSEONRS(X)/3GOTO16
6,159
234 AB=0:AA=0:C1=0:C2=0:C5=0:AR=
0:AP=0
235 IFRS(X)=6THEN160ELSEIFC6=1TH
ENAQ=0:C6=0:GOTO236ELSEAQ=1:GOTO
103
236 AT=0:ONRS(X)GOTO143,131,,190
,154,,173,207,182,174
237 IFAE=1THENRETURNELSEAE=1:X=R
ND(6):CLS:PRINT:PRINT"THE BOX OP
ENS.":PLAY"L1A#P8V10T3L2B-9":PRI
NT"IT CONTAINS:
238 IFX<3THENY=RND(2000):G=G+Y:P
RINTTAB(10)Y"GOLD COINS
```



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```
239 IFX=4THENS=S+1:PRINTTAB(10)"
A BAG OF SALT"ELSEIFX=5THENBP=BP
+1:PRINTTAB(5)"A BOTTLE OF GREEN
 LIQUID":INPUT"DO YOU WANT TO DR
INK IT (Y/N)";A$:IFA$="Y"THENPRI
NT"YOU DRINK AND IT IS POISON":B
P=BP-1:BV=BV+1:GOSUB3:GOTO243
240 IFX=6THENPRINTTAB(10)"NOTHIN
G"ELSEIFX=3THENPRINTTAB(5)"A BOT
TLE OF RED LIQUID":B=B+1:INPUT"D
O YOU WANT TO DRINK IT (Y/N)";A$
:IFA$="Y"THENBV=BV+1:B=B-1:CLS:P
RINT"YOU JUST DRANK ELIXIR OF LO
NG   LIFE. YOU ARE NOW SURE THAT
 YOU WILL NOT DIE.":AC=1
241 PRINT:PRINT"YOU NOW HAVE:":P
RINTG"GOLD COINS":PRINTS"BAGS OF
 SALT":PRINTB"BOTTLES OF ELIXIR
OF LONG        LIFE":PRINTBP"BOTT
LES OF POISON":PRINTBV"EMPTY BOT
TLES":PRINT:PRINT"---PRESS ANY K
EY TO CONTINUE.--"
242 IFINKEY$=""THEN242ELSESCREEN
1,0:RETURN
243 C2=0:C1=0:IFAC=0THEN245ELSEP
RINT:PRINT"YOU SHOULD BE DEAD NO
W. YOU ARE LUCKY YOU DRANK ELIXI
R OF LONG  LIFE. ";
244 IFAU=1THENPRINT"HOWEVER, YOU
 DON'T HAVE A CAR SO YOU WILL HA
VE TO FIND ONE":GOSUB3:GOSUB3:C8
=0:A7=0:AG=0:GOTO31ELSEC8=0:PRIN
T"THIS WAY I CAN SEND YOU   BACK
 ON THE ROAD.":GOSUB3:GOTO91
245 X=RND(3):IFX=2THENPRINT:PRIN
T"YOU ARE LUCKY, YOU COULD HAVE
  DIED. YOU SPEND SOME TIME AT T
HEHOSPITAL AND NOW YOU ARE OK.
  YOU STILL HAVE EVERYTHING";:IF
AU=1THENPRINT" EXCEPTTHE CAR WHI
CH WAS DESTROYED IN  THE ACCIDEN
T.":C8=0:AG=0:AR=0
246 IFX=2THENPRINT:PRINT"PRESS <
ENTER> WHEN YOU WILL FEELREADY T
O GO ON."ELSE248
247 IFINKEY$=""THEN247ELSEIFAU=0
THEN91ELSEAU=0:PRINT:PRINT"YOU L
OST THE CAR, SO YOU WILL   HAVE
TO FIND ANOTHER ONE":GOSUB3:A7=0
:C8=0:A5=0:AS=0:GOTO31
248 PRINT@331,"YOU'RE DEAD";
249 PRINT@448,"****** ANOTHER GA
ME (Y/N)? *****";
250 A$=INKEY$:IFA$="Y"THENRUNELS
EIFA$="N"THENPOKE65494,0:ENDELSE
IFA$=""THEN250ELSEGOTO249
251 A$=INKEY$:IFA$=""THEN251ELSE
PRINT@231,"ONE MOMENT PLEASE!":R
UN
```

EDUCATION NOTES

16K ECB

Learning The Signs

By Steve Blyn
Rainbow Contributing Editor

This month's article deals with signed numbers. Those are the little nasties that have signs in front of the numbers. Mastery of signed numbers is an important skill needed in many areas of mathematics. Teachers introduce signed numbers when they deal with the set of positive and negative integers.

It is always best to introduce new concepts to children by relating to real life situations. There are two such readily available situations in the life of all children — money and the weather.

All children love to make purchases. We have successfully used a game of checks and bills to teach the addition of signed numbers. Checks represent money received and are positive or '+' numbers. Bills represent money spent and are negative or '–' numbers.

A game is played with the students by choosing a check and a bill for a purchase. The learning is in the computation of the resulting balance. When this is mastered, the result of a set of checks and bills can be computed. This approaches the later skill of balancing a checkbook.

Temperature changes are another good way of teaching the addition of signed numbers. Our game adds a change in temperature to the last reported temperature to find the new temperature. Let's suppose the current temperature is 60 degrees. If the temperature goes up three degrees, a plus three is added to 60. If the temperature falls three degrees, a minus three is added to 60 degrees.

The difficulty really begins when the temperature falls below zero. It is a surprising fact that many children believe that zero degrees is the lowest possible temperature. If the temperature is three degrees and falls eight degrees, the new temperature is five degrees below zero or minus five. If the temperature is minus five and rises six degrees, the new temperature is plus one.

$$\begin{array}{rr} & +3 \\ + & -8 \\ \hline & -5 \end{array} \quad \text{and} \quad \begin{array}{rr} & -5 \\ + & +6 \\ \hline & +1 \end{array}$$

Teaching subtraction of signed numbers is a more difficult task. The rule for subtraction of these numbers is to change the sign of the second number and *add*: (plus 15) minus (minus three) becomes (plus 15) plus (plus three). The answer is plus 18.

$$\begin{array}{rr} & +15 \\ - & -3 \\ \hline \end{array} \quad \text{becomes} \quad \begin{array}{rr} & +15 \\ + & +3 \\ \hline & +18 \end{array}$$

The program opens by giving a menu choice of addition or subtraction of signed numbers or of exiting the program. This is contained on Lines 40 to 110. Lines 120 through 300 contain the addition routines. Lines 310 through 490 contain the subtraction routines. After each example, you may either continue or return to the menu.

We felt that students would continue to practice these examples until they are mastered; therefore, there is no set number of examples to do. We have included a counter of the number of right and wrong examples attempted. This is on the screen at all times.

The difficulty of the examples is preset on Lines 150, 160, 340 and 350. We set the difficulty for a beginner's level. Please feel free to adjust the level of difficulty to your students' needs. As this skill becomes mastered, change the level to create more difficult examples for added practice.

In closing, we would like to mention a new product that has come to our attention which may be of interest to the educational community. It is called *Word-Pak* and is manufactured by PBJ, Inc. It is a program and a ROM pack that contains a driver to turn the CoCo's screen into a profes-

---

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

sional 80-column board. Of course, the main use of this device is in running business software. It does, however, also convert your screen into a very professional looking screen for educational programs that you may write. One of the biggest criticisms of the CoCo is its use of inverse capitals for lowercase letters. *Word Pak* produces the normal lowercase letters with which children are familiar. Light on dark or dark on light backgrounds are available. The dark letters on light background option also creates lines which make the screen resemble notebook paper. This product certainly opens new avenues for the creative user.

260 130
END 151

The listing:

```
10 REM"<C> STEVE BLYN,1984
20 REM"COMPUTER ISLAND,NY
30 S$=STRING$(32,239)
40 CLS8
50 PRINT@44,"MENU";
60 PRINT@135,"1. ADDITION";
70 PRINT@199,"2. SUBTRACTION";
80 PRINT@263,"3. END THE PROGRAM
";
90 PRINT@484,"PRESS THE CORRECT
NUMBER";
100 G$=INKEY$
110 IF G$="1" THEN 120 ELSE IF G
$="2" THEN 310 ELSE IF G$="3" TH
EN 500 ELSE 100
120 CLS:PRINT@7,"add signed numb
ers";
130 PRINT@32,S$;
140 PRINT@320,"    CORRECT=";C;"
 WRONG=";W
150 M=RND(10)-RND(15)
160 N=RND(5)-RND(10)
170 K=M+N
180 IF M>0 THEN PRINT@ 103,"+";
190 PRINT@104,M;" +  ";N;" = ";
200 IF N>0 THEN PRINT@111,"+";
210 PRINT@114,"";
220 INPUT J
230 PRINT:PRINT
240 IF J=K THEN PRINT"
 CORRECT":C=C+1:SOUND240,3
250 IF J<>K THEN PRINT"   SORRY,
THE ANSWER IS ";K:W=W+1:SOUND1,1
260 PRINT@320,"    CORRECT=";C;"
 WRONG=";W
270 PRINT@448,S$;
280 PRINT@480,"'C' TO CONTINUE O
R 'M' FOR MENU";
290 A$=INKEY$
300 IF A$="M" THEN RUN ELSE IF A
$="C"THEN 120 ELSE 290
310 CLS:PRINT@4,"subtract signed
 numbers";
320 PRINT@32,S$;
330 PRINT@320,"    CORRECT=";C;"
 WRONG=";W
340 M=RND(10)-RND(15)
350 N=RND(6)-RND(10)
360 K=M-N
370 IF M>0 THEN PRINT@103,"+";
380 PRINT@104,M;" -  ";N;" = ";
390 IF N>0 THEN PRINT@111,"+";
400 PRINT@114,"";
410 INPUT J
420 PRINT:PRINT
430 IF J=K THEN PRINT"
 CORRECT":C=C+1:SOUND240,3
440 IF J<>K THEN PRINT"   SORRY,
THE ANSWER IS ";K:W=W+1:SOUND1,1
450 PRINT@320,"    CORRECT=";C;"
 WRONG=";W
460 PRINT@448,S$;
470 PRINT@480,"'C' TO CONTINUE O
R 'M' FOR MENU";
480 B$=INKEY$
490 IF B$="M" THEN RUN ELSE IF B
$="C" THEN 310 ELSE 480
500 CLS:END
```

AT WITS END
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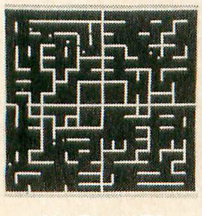
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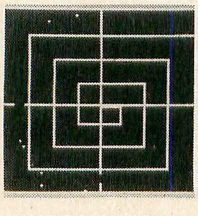
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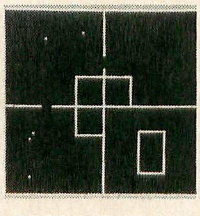
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Everything You Always Wanted To Know About The CoCo But Radio Shack Didn't Tell You

By Andy Kluck

In response to the introductory page of the first section of Radio Shack's *Getting Started with Color BASIC*, which invites the reader to "prove us wrong (if you can)," I have made an attempt to compile a list of some of the major errors and omissions in the Color Computer's documentation. In this article and in the following installments, I will also outline some of the techniques that can be helpful in using the CoCo that were not mentioned in the manuals. One of the examples assumes that the PLUCK function has been previously defined with the Extended BASIC *DEF FN* statement:

```
100 DEF FN PL(X)=PEEK(X)*&H100+ PEEK(X+1)
```

This function returns the value of the two-byte integer at the address specified by the argument, and is useful for examining Color BASIC's pointers. Hexidecimal numbers in this text are identified by the dollar sign; this should be replaced by *&H* in Extended BASIC expressions. I will refer to Radio Shack's *Getting Started with Color BASIC*, *Going Ahead with Extended Color BASIC*, and *Color Computer Disk System Owners Manual and Programming Guide* as the Cbasic, Xbasic, and Dbasic manuals respectively. Some of this information has been previously published, and is included here in the interest of completeness. If you find any mistakes, please be advised that they are intentional; I tried to include something for everyone, and some people are always looking for mistakes. (I'll bet you had fun with Radio Shack's manuals.)

Release Numbers — When Extended or Disk BASIC is activated, the sign-on message gives the revision number of the highest level ROM in the system, ignoring the revision numbers of the other ROM or ROMs. These statements may be used to determine the hidden revision numbers of the Color BASIC and Extended ROMs:

```
PRINT PEEK(41301)-48 ' Revision of Color BASIC
PRINT PEEK(33023)-48 ' Revision of Extended BASIC,
if applicable.
```

General Information — Color BASIC only accepts line numbers from 0 to 63999. Whenever program lines are added, edited, renumbered, or deleted, a *CLEAR* is executed. A question mark may be used as an abbreviation for *PRINT*, and a single quote (shifted 7) may be substituted for *: REM*.

Variables and Spacing — According to the Cbasic manual, variable names may be any combination of one or two letters. Actually, the second character may be a letter or a digit, and they may be followed by as many letters and digits as you want; however, only the first two are significant, so

(Andy Kluck is an electrical engineering student at the University of Texas at Austin.)

AB and ABC are the same variable. Also, variable names may not begin with any BASIC keyword. These rules also apply to array names and defined functions. Note that unlike Level II BASIC, Color BASIC allows BASIC variables to contain BASIC keywords as long as they don't begin with them; *XPRINT* is a legal name for the variable *XP*. The Color BASIC manual says that spaces in a program may be removed to save memory. This is true in most cases, but there is an important exception. Wherever a variable or Hex constant or octal constant with the optional 'O' included is followed by a BASIC keyword without an intervening space, the tokenize routine will consider the keyword as part of the variable or constant, usually causing a Syntax Error. The most common examples are statements like:

IFA=BANDC=DORE=FTHENG=HELSEEND (Needs spaces before *AND*, *OR*, *THEN* and *ELSE*)
FORA=&H1FTO&H3FSTEP2 (Needs spaces before *TO* and *STEP*)
ONXGOTO 100,200 (or *GOSUB*; Needs space before *GO*)
PRINT XTAB(10)Y (with spaces means *PRINT X;TAB(10);Y*. Without spaces means *PRINT XT(10);Y*)

Examples where the extra spaces are not necessary include:

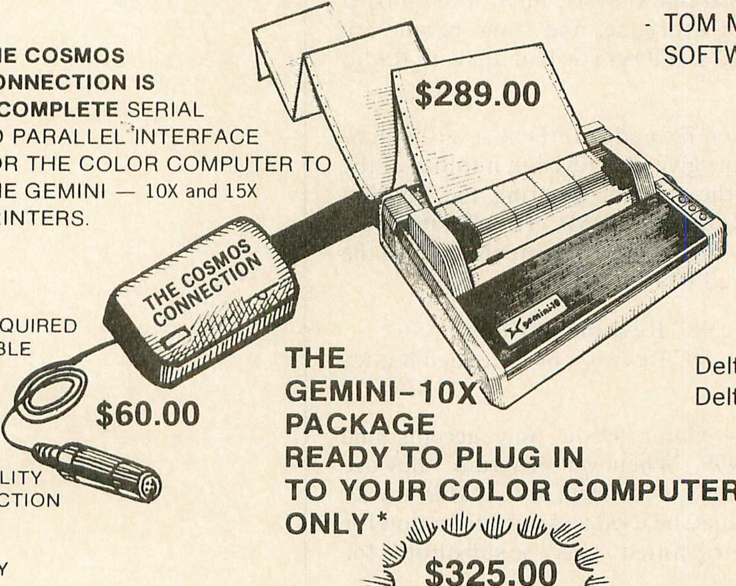
IFA=3ANDC=5ORE=7THENG==2ELSEEND
FORA=31TO63STEP2
ONX+1GOTO 100,200

Reset — There are several sensitive routines in BASIC that will cause the BASIC program or variables to be scrambled if they are interrupted by Reset, so Reset should in general be used only when the BREAK key is repeatedly ignored, such as during *PAINT* or a machine language program. It is generally safe to use Reset to stop tape I/O, but not disk I/O, except in special circumstances, such as when you accidently *DSKINI* the wrong disk. Note that Reset leaves all open files open. At least one version of the Extended BASIC manual explains the Reset sequence on Page 208, mentioning the restart flag *RSTFLG* and restart vector *RSTVEC*, but doesn't give their addresses. *RSTFLG* is at $71, and *RSTVEC* is in bytes $72-$73.

Errors — Whenever an error occurs, Color BASIC turns off the cassette motor and does an *AUDIO OFF*. In Disk BASIC, it also closes all disk files.

CONT — Any of these statements and actions: *CLEAR*, *PCLEAR*, *FILES*, pressing Reset, any error, or changing the program, disables the *CONTinue* statement until the next *STOP*, *END* or BREAK in the program. The reason for this is that all these conditions re-initialize BASIC's stack area, including records of subroutine calls and *FOR . . . NEXT* loops, so that if a *CONTinue* were allowed, the program would probably not work right anyway.

CLEAR — Besides clearing variables as described in the Color BASIC manual, *CLEAR* cancels all *DEF FN* statements and performs a *RESTORE*. Statements of the form: *CLEAR 200* allocate the specified number of bytes for string space. To prevent an OS Error, there must be one byte allocated for each character in a string variable except variables that are fielded in disk buffers, read from data statements, or defined as literals in the program: *50 A$="str"*



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+*"ing"* uses six bytes of string space, but *50 B$="string"* uses no string space because the BASIC only needs to remember where the string is located in the program text. There also must be enough string space for temporary strings that are formed while expressions are evaluated. Usually it is best to overestimate the amount of string space by a few hundred bytes unless the program and variables use up almost all the RAM, since *INPUTed* strings may be up to 249 bytes long. To allocate half of the available memory to strings:

```
CLEAR 0:CLEAR MEM/2
```

It is often helpful to know how much string space is left unused. In Level II BASIC, the *FRE* function, when used with a string argument, causes the free and "in use" string space to be separated and returns the number of free string bytes. Color BASIC doesn't have this function, but it can be duplicated by using the Color Computer's "garbage collection" routine and then taking the difference between the bottom of used strings and bottom of string space pointers:

```
EXEC 46481:FRE= FNPL(35)- FNPL(33)
```

gives the amount of free string space. According to the Color BASIC manual, "Without *CLEAR*, the Computer reserves 200 characters." Actually, a *CLEAR 200* is done only when BASIC is first entered. The number of reserved string bytes is not affected by *LOAD* or *RUN* and is inherited from the last program; therefore, no program should assume that 200 bytes are reserved, since the last program run may have reserved 0 or 10000. For this reason, all substantial programs should use *CLEAR* to reserve string memory. Statements of the form: *CLEAR 200,23999* allocate the first number of bytes for string space and set the end of the string pool to the address of the second number minus one. Since the end of the string pool plus one is the highest RAM area used by BASIC, the area starting with the given address plus one, 24000 in this case, is made available for the user's machine language routines. Note that BASIC positions the stack to build down from the bottom of the string pool, so in this example the stack will be in the area just below 24000–200 = 23800.

PCLEAR **—** According to the Extended BASIC manual, a *PCLEAR 4* is done automatically, and *PCLEAR* is necessary only "when you want to reserve a different number of pages." In fact, the number of *PCLEARed* pages is also inherited from the last program run, so this number may be anything from one to eight when a new program is loaded, and no program should make assumptions about this number. The manual also says that *PCLEAR* should be the first or second statement in the program, right after *CLEAR*. This advice could cause problems in many cases because the *PMODE* parameters are also unaffected by *LOAD* operations. For example, if the last program used *PMODE 4,5* and the new program tries to *PCLEAR* any fewer than eight pages without first setting *PMODE* to a reasonable value, an FC Error will occur. Furthermore, whenever *PCLEAR* is used with a different number of pages than the last *PCLEAR*, the BASIC program is moved up or down in memory according to the new number of pages. This, in itself, wouldn't cause any problems, except for the now infamous *PCLEAR* bug in the Xbasic 1.0 ROM —after *PCLEAR* copies the program to its new position, it doesn't set the interpret pointer at $A6 to the new copy. This can

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have several results. Sometimes an unexplained Syntax Error occurs on the line with *PCLEAR*. Often the program runs normally until the *PCLS* statement is present, which erases the old copy of the program, since it is now in the area of the graphics screen, and causes either an error or a forced *END*. In rare cases, *PCLEAR* may result in a jump to another part of the program. Usually, when *PCLEAR* causes an error, the program will work if it is *RUN* a second time, since it has already been moved to the correct address. To prevent this problem in the first place, two steps have been suggested. First, if *PCLEAR* reduces the number of graphics pages, it should be at the end of the program, and if it increases the number of pages, it should be at the beginning. This prevents the immediate error that occurs when the *PCLEAR* statement is overwritten by another part of the program. Second, to set the interpret pointer to its correct position after *PCLEAR*, use a *GOTO* statement that references a line number less than the current line. To prevent as many errors as possible, I recommend using something like:

For *PCLEAR 1*:

```
10 GOTO 63990
20 CLEAR 500
30 REM PROGRAM STARTS HERE
63980 END
63990 PMODE 0,1:PCLEAR 1:GOTO 20
```

For *PCLEAR 2* through *8*:

```
10 GOTO 63990
20 GOTO 40
30 CLEAR 500: PCLEAR 5: GOTO 20
40 REM PROGRAM STARTS HERE
63980 END
63990 PMODE 0,1:PCLEAR 1:GOTO 30
```

Here the *PMODE* statement in Line 63990 prevents a possible FC Error in the *PCLEAR 1*, which, in turn, prevents an error in the *CLEAR 500*, which might occur, for example, if the last program used *PCLEAR 8* and there is not enough free memory for *PCLEAR 8* and 500 bytes for strings. The extra *GOTOs* force BASIC to recover from the bug. The *CLEAR* statements and the *PCLEAR* in Line 30 of the second example should be adjusted according to the needs of your program. A shorter version, for example: *10 PMODE 0,1:CLEAR 0:PCLEAR 5:CLEAR 500* would be sufficient for use with Xbasic 1.1, but since many users are stuck with 1.0, programs to be distributed to others should allow for the bug. Note that *PCLEAR* also does an implied *CLEAR*, erasing variables and defined functions.

PCLEAR 0 — They said it couldn't be done, and they were right — Various methods have been suggested for effecting a *PCLEAR 0*. An often published example is:

```
POKE 25,6:NEW
```

There are two problems with this. First, it moves the BASIC program to $601, which is only correct for plain Extended BASIC. If this is used in Disk BASIC, it jumbles system pointers and variables with the likely result that when you try to load a BASIC program, part of it will be written out on the disk in place of the File Allocation Table. (I hope you made backups.) Second, BASIC will give an error if you try to execute a *NEW* or *RUN* without a zero in the byte before the program. If Xbasic has just been started, there is a zero in this location, but use of graphics page 1 may change this. To fix these problems, try this revised *PCLEAR 0*:

```
POKE 25,PEEK(&HBC):POKE PEEK(&HBC)*256,0:
NEW
```

Address $BC contains the high byte of the start address of graphics page one, which is 6 for non-Disk Extended BASIC and varies with *FILES* in Disk BASIC. But this is still not a real *PCLEAR 0*; I would call it a *PNEW 0*. To *PCLEAR 0* from inside a program, part of the *PCLEAR* routine can be used to do the necessary moving of the program:

```
10 GOTO 63950
20 CLEAR 200 ' or whatever
30 REM PROGRAM STARTS HERE
63940 END
63950 POKE &H3C0,&H5F:POKE &H3C1,&H5C
'CLRB, INCB- $01 in B, Clear Carry
63960 POKE &H3C2,&H96:POKE &H3C3,&HBC
'LDA $BC
63970 POKE &H3C4,&H1F:POKE &H3C5,&H02
'TFR D,Y
63980 POKE &H3C6,&H7E:POKE &H3C7,&H96:
POKE &H3C8,&HA3 'JMP $96A3
63990 EXEC &H3C0:GOTO 20 ' PCLEAR 0
```

This works with Xbasic 1.0 and 1.1. Of course, since any *PCLEAR 0* places the BASIC program where the graphics screens are supposed to be, any use of graphics statements afterwards should be avoided unless special arrangements have been made. For example, the addition of these lines:

```
30 POKE &HBA,&HE6:POKE &HB7,&HFE
40 POKE &HB9,&H20:POKE &HB6,3
```

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will direct the action of any graphics statements to the area $E600 through $FDFF. This prevents graphics statements from causing problems; and, in the 64K BASIC in RAM mode, it allows normal use of one *PMODE 3* or *4* screen in otherwise unused RAM. For example,

```
50 PCLS 1:SCREEN 1,0:CIRCLE (128,96),90,4
60 GOTO 60
```

draws a big *PMODE 3* circle using "free" memory with *PCLEAR 0* still in effect *if* the SAM has already been set to the 64K RAM mode and BASIC has been copied into the upper page of RAM with a *MOVEROM* program. The *PCLEAR 0* effectively disables *PMODE*, but *PMODE 3* or *4* may still be selected by *POKEing* the 3 or 4 into location &HB6; *PMODEs 0* through *2* require some additional *POKEs* to set up correctly. Because *PCLEAR* is disabled by Line 30, the only way to bring the system back to normal is something like:

```
POKE &HBA, PEEK(&HBC):POKE &HB7, PEEK
(&HBC)+6:PCLEAR 1:PMODE 0,1
```

PCLEAR 0 graphics should not be used if Extended BASIC has been relocated for extra free memory or any RAM in the range $F600-$FDFF is in use. Finally, *FILES* should be avoided while this is in effect.

FILES — According to the Disk BASIC manual, the statement *FILES 1,400* reserves space for 1 file and 400 bytes of buffer space for it. Actually, the first number specifies only the number of files that can be accessed by *OPEN*; one extra file control block is reserved for use by *LOAD(M)*, *SAVE(M)*, *MERGE*, and *COPY*. The second specifies the number of bytes to be reserved for random file buffers. To prevent an OB Error, this number must be >= the sum of the record lengths of random (direct) files to be open at the same time. Since this buffer space is not used by files opened for sequential access, the program on Page 55 demonstrating the necessity of *FILES 1,400* would work just as well without it. A more appropriate example would have been to open a random (direct access) file with a record length of 400. There are also problems in the *FILES* routine itself. Use of *FILES* involves displacement of the graphics area, and *FILES* will sometimes set the start of page one to an odd page boundary in Dbasic 1.0. Since the SAM chip can only handle graphics on even pages, this results in garbage appearing at the top of the high resolution picture. To prevent this, test your *FILES* statement on a computer with Dbasic 1.0 (In RAM, if necessary, I hope to soon publish a routine to install different BASICs from disk files into the upper-half of the 64K RAM.) before putting it in the program and check the contents of location $BC. If *PRINT PEEK(&HBC)* gives an odd number after *FILES*, add 256 to the second number in *FILES* and try again. *FILES* also may require moving the BASIC program, and in Disk BASIC 1.0 it has the same bug, with similar solutions, that *PCLEAR* does. Note that many BASIC and machine language programs assume that graphics Page 1 begins at $E00 and makes use of this area. If *FILES* causes Disk BASIC's file handler variables to move into this area, these programs could cause a crash; therefore, it is a good idea to print a warning to the user when a program's use of *FILES* causes *PEEK(&HBC)* to exceed 14. Finally, executing *FILES* closes all disk files and does an automatic *CLEAR*.

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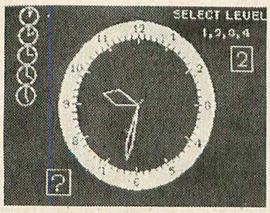

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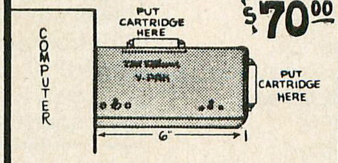

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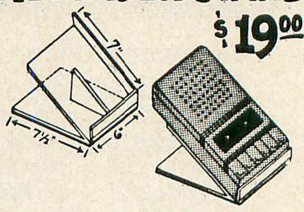

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BITS AND BYTES OF BASIC

4K

Weird And Wonderful

By Richard White
Rainbow Contributing Editor

Programming a computer is always full of surprises. Perhaps that is why many of us keep at it in spite of its many frustrations. This month, we are going to play with a program sent in by James Shera of Altus, Okla. Jim took me up on my challenge to write a *PRINT USING* routine for Color BASIC in April 1984 "Bits and Bytes." Jim's code is not the general subroutine I had in mind, but addresses right justified printing of strings and formatting a number to print with alignment on the decimal point. There is a lot to comment on in the logic of his routines. He also added a few pokes I had not seen before which open a whole box full of surprises. Now a surprise may be good or bad, and there are some of both in what we will examine here.

Jim's program essentially makes a formatted listing of outstanding checks, adds the amounts and prints the total amount to the screen or printer. A simple program that will not distract us from studying the *how* rather that the *what* is done. The whole program, along with some experiments I added, is at the end of the column.

The jewels begin in Line 53.

```
53 POKE 298,0:POKE303,0 'DISABLES EXTENDED
   BASIC
```

Line 53 turns both Extended and some of Disk BASIC off. It is used here to assure that the program really will work in Color BASIC. I made a few tests from the keyboard just like any doubter would. If you temporarily add *54 END*, you can type *GOTO 53* from the keyboard and *RUN* that line only and come back to the keyboard mode. Then type *PRINT USING"##.##";22.897* and ENTER. The computer will respond:

```
0 ##.## 22.897
OK
```

Color BASIC does not recognize *USING* as a keyword and thinks it is just another variable which, not having been defined before, equals zero. It then dutifully prints the string and the number following exactly as entered from the keyboard. *SAVE"PROGNAME"* returns an SN Error as expected. But, I could open a disk data file, save data to it and close it with Extended BASIC "off." Obviously, the *OPEN* and *PRINT#D* statements use routes through BASIC that are not affected by the above *POKEs*. BASIC is assuredly "off" only when it has not been "on." When the CoCo comes up in Extended and Disk BASIC, a variety of addresses are set differently than they are in the lower level BASICs.

Two pokes change only two of these "hooks." It's like the front and back doors are locked, but we can climb in through the basement window to get into part of the house.

Let's now turn Extended BASIC back on and try again.

```
288 POKE298,25:POKE303,14 'ENABLES
    EXTENDED BASIC
290 CLOSE:END
```

Type *GOTO288*. Then from the keyboard mode type *PRINTUSING"##.##";22.897*. The computer replys:

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS data base management program.)

```
22.90
OK
```

Now the result is as we expect with *PRINT USING* functioning. Note that an Error was not reported in Color BASIC because it could treat *USING* as a variable. We talked last month about variables longer than two characters being accepted by CoCo and will review the topic below.

Observe Line 55 and then I will give you the good news and the bad news.

```
55 POKE360,162:POKE361,191 'ENABLES SCREEN
   PRINT
```

The good news is that these pokes cause text to be written to the screen and to the printer *at the same time*. But, there is bad news. Once you have done this poke, you will not be able to save a data or ASCII file to disk. The file is opened and closed correctly, but no data is stored.

```
285 POKE360,130:POKE361,115 'DISABLES SCREEN
    PRINT
```

Line 285 stops the dump to the printer and restores the capability to send files to the tape. I am running Disk BASIC and this indeed does stop the dump to the printer, but still redirects ASCII file text to the screen. After a cold start in Disk BASIC, addresses 360 and 361 contain 203 and 74 rather than 130 and 115. This is a good example of that magical device called a hook. Together, 360 and 361 contain an address to code in the highest level of BASIC in your machine. This hook directs control to the highest level BASIC available which then calls routines in lower level ROMS. If you are running a disk change the line to the following:

```
285 POKE360,203:POKE361,74 'DISABLES SCREEN
    PRINT
```

Now I got a surprise here; I had to do some digging to find out why the expected result was not obtained and learned something along the way. No damage was done. You can expect surprises when you poke numbers in memory sections that are controlling CoCo's operation. You can also expect that what works with Extended BASIC will not work with Disk BASIC. ROM updates will have code at different addresses and *POKEs* that work with Disk BASIC 1.0 will not work with the greatly revised Disk BASIC 1.1. Radio Shack has taken pains to make sure that published BASIC works the same in both versions. Version and level considerations are one reason I have made very little use of *POKEs* in the column. However, you can *POKE* and *PEEK* all you want. You will learn a lot about your machine and the worst that can happen is that it may "go west." Just turn it off and then back on and start over.

Lines 60 to 90 set up a menu and allow the user to choose whether to send the output to the screen or printer. But we just went through something like that didn't we? First, Jim wants to have a different format to the printer than he would use on the screen. Second, the Line 55 *POKEs* provide the ability to put the screen format to both the screen and printer for program development and documentation purposes. The user might not want to do this very often. In fact the program listing I received has Line 55 code preceded by a single quote, turning it into an inoperative REM.

```
55 'POKE360,162:POKE361,191 'ENABLES SCREEN
   PRINT
60 Q$=CHR$(34)'QUOTATION MARKS
70 CLS:PRINT@228,"PRESS "Q$"ENTER"Q$"FOR
   SCREEN "
   :PRINT@260,"PRESS "Q$"P"Q$" FOR HARD
   COPY"
80 A$=INKEY$:IFA$=""THEN80
90 IFA$<>"P"THEN D=0:X=4:Y=10:Z=31:WIDTH
   =32 ELSE
   D=-2:X=30:Y=40:Z=60:WIDTH=80
```

Lines 60 and 70 show you how to print quotation marks to the screen. Here *Q$* is defined as *CHR$(34)*, the ASCII value for a quotation mark. *Q$* then appears in the code following the *PRINT* statement. In this case ENTER and P will be enclosed by quotes. Line 80 is the conventional *INKEY$* routine and Line 90 tests for a P as input and sets tabs (X,Y and Z) and *WIDTH* depending on the *INKEY$* entry. From here on we will see a number of long variable names. They do make the code more readable. You have to be very careful since only the first two letters are significant and conflicts with reserved words are more likely. I think Jim edited the program to add long variables after he got it up and running. One variable he used was *TOTAL*, which seems like a good name for carrying the total in. But it bombs the program since CoCo sees *TO*, a reserved word and calls SN Error. SUM works and is descriptive.

Earlier, I mentioned the fact that I was able to make a file on disk even though Extended BASIC was "off." I wanted to do this so I could route the program output to an ASCII file and then bring it into this article through the Append Mode of *Telewriter*. Jim had already set up his *PRINT#D* statements with a variable so device numbers could be chosen by the program. D is set in Line 90 as 0 for the screen and -2 for the printer. I added code Lines 94 through 96 to provide the file option.

```
94 IFA$<>"P"THENA$="SCREEN"ELSEA$=
   "PRINTER"
95 PRINT@324,"PRESS 'D' FOR DISK FILE"
96 B$=INKEY$:IFB$="D"THEND=1:OPEN"O",#1,
   A$ ELSEIFB$=""THEN96
```

In Line 94, A$ is checked for a "P" and redefined as SCREEN or PRINTER to provide file names. Line 95 prints the option to the menu. Line 96 is an *INKEY$* loop that sets D=1 and opens a disk file for output, using #1 buffer, whose name is in A$. Any key other than "D" drops to the next line without opening the file.

Normally, there would be some sort of routine for data input. Since the program was designed to demonstrate some BASIC procedures, data is provided in *DATA* statements. This is a good temporary approach when developing and debugging a program. You can later write the input code after the processing routines work. Lines 100 through 160 include initialization of two variables and the *DATA* statements.

```
100 ITEM$="OUTSTANDING CHECKS"
110 UNIT=1
120 DATA 89,FEB 29,100
130 DATA 999,APR 15,21.35
140 DATA 1000,APR 16,1872.99
150 DATA 1001,APR 18,21.90
160 DATA 9999,EOF,0
```

A *DATA* statement consists of the keyword *DATA* followed by fields of data separated by commas. You do not have to make a distinction between string data and numbers in the data statement itself. You make the destinction in defining your variables in the *READ* statements. The above *DATA* statements consist of a check number which will be treated as a string, a date string and a value which will be treated as a number. Line 190 *READs* the data.

```
190 READ CHECKS$,DATE$,AMOUNT
```

We are going to print a table and all tables need headings. Lines 170 and 180 perform these chores. The name of the table is held in the variable *ITEM$*. Line 170 performs a calculation to center this name. It's a simple subtract the text length from the line *WIDTH* and divide by two to establish the location to start printing.

```
170 CLS:PRINT#D,TAB((WIDTH-LEN(ITEMS$))/2)
  ITEM$:PRINT#D,“ ”
180 PRINT#D,TAB(X-3)“NO.”;TAB(Y+1)“DATE”;
  TAB(Z-6)“AMOUNT”:PRINT#D,“ ”
```

Column headings are trickier. Check number and amount are to be right justified so the tab values X and Z refer to the last right column to contain a character. Dates are left justified so the tab position Y is the first column from the left to print. In Line 180, print locations for *NO.* and *AMOUNT* are counted back left from X and Z while the heading *DATE* is centered one character right of the date tab Y.

Data processing occurs in lines 200 through 250. First *DATE$* is checked for an *EOF*. In this case *EOF* was included in the terminating record date field in Line 160. This method could be used for a keyboard input routine. Plenty of alternates exist such as -1 in the check number (surely nobody numbers their checks in a series using a -1). If an EOF is found, the program goes to Line 260 to develop totals and finish the table.

```
200 IF DATE$=“EOF”THEN260
210 SUM=SUM+AMOUNT
220 COUNTER=COUNTER+UNIT
230 N=AMOUNT:GOSUB1010
```

COUNTER simply counts the number of outstanding checks. *UNIT* was defined as one in Line 110. View it as a constant that might need to be changed at some future time. If all constants used in a program are grouped together and defined at one place in the program, changes to the constants are easy and one change will affect all places that a constant is used in the program. Here the application is trivial, but demonstrates the procedure.

In Line 230 is a subroutine call to 1010. A good subroutine will be general in nature so it can be called from a number of places in the program. This subroutine takes a number, N, and returns a formatted string N$. Here the number we want to format is in *AMOUNT* so we make the assignment *N=AMOUNT* and *GOSUB 1010.*

```
240 PRINT#D,TAB(X-LEN(CHECK$))CHECK$;TAB
  (Y)DATE$;TAB(Z-LEN(N$))N$
250 GOTO190
```

Line 240 prints the data much like we printed headings except the computer is given the task of calculating the lengths of strings *CHECK$* and *N$* and counting back from tab locations X and Y.

```
260 N=SUM:GOSUB1010
270 PRINT#D:PRINT#D,TAB(X)COUNT“CHECKS”
280 PRINT#D,TAB(X)“TOTAL AMOUNT”TAB(Z-L
  EN(N$)-1)“$”N$
285 ...
288 ...
290 CLOSE:END
```

Line 260 is the second call to 1010 and N now carries the value from *SUM.* In Line 270 *COUNT* is the same variable as *COUNTER* (remember only the first two characters are meaningful). Note in Line 280 the position to print is moved left by one to allow for the $. In Line 290 a *CLOSE* is included just in case we had the file open. If it were not opened, nothing is lost. And here is how the result looks on the screen. The printer output is similar, but more spread out and is centered on the page.

```
                  OUTSTANDING CHECKS

            NO.        DATE           AMOUNT
             89        Feb. 29        100.00
            999        Apr. 15         21.35
           1000        Apr. 16      1,872.99
           1001        Apr. 18         21.90

       4 Checks
   Total Amount                    $2,016.24
```

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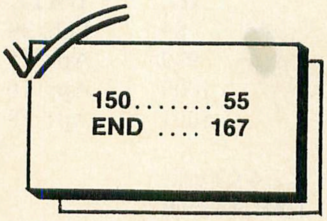
Now we come to the subroutine all the foregoing program was written to demonstrate. It is the equivalent of *PRINT USING* with the format string "###,###.##". Instead of printing the string, the subroutine returns a formatted string that is printed later. *PRINT USING* rounds the second decimal place so that's the first thing done in Line 1010 as well as converting the result to a string without a decimal (*100).

```
1010 N$=STR$(INT((N+.005)*100))

1020 IFLEN(N$)>6THEN1050
1030 N$=MID$(N$,2,LEN(N$)-3)+“.”+RIGHT$(N$,2)
1040 GOTO1060 'ALTERNATE 1040 RETURN
1050 N$=MID$(N$,2,LEN(N$)-6)+“,”+
 MID$(N$,LEN(N$)-4,3)+“.”+RIGHT$(N$,2)
1060 RETURN
```

A string made from a number using *STR$* carries a leading space. Line 1020 takes this space into account in testing whether there are six or more digits and the comma insertion, Line 1050, is to be used. Line 1030 takes a five digit or smaller number and inserts a decimal point before the second digit from the right. Basically a left-hand portion of the string is obtained, a point is added and the right two digits are added. The *GOTO1060* only sends the program to a *RETURN* statement. My preference is to throw out the *GOTO* and use a return. Line 1050 is like 1030 except a comma is added.

This subroutine is specific to a particular need, formatting a number and returning it as a string. Now that you have an example of how it is done, try your own.



The listing:

```
10 REM **COLOR BASIC PRINT USING
 ROUTINE** 21 APR 84  JAMES SHER
A
20 REM WITH EXAMPLES OF MULTIPLE
 DEVICE CENTERING AND TABBING
30 REM D...DEVICE NO.
40 REM X, Y, & Z...TAB LOCATIONS
50 REM TOTAL ... 2ND CHARACTER =
 ZERO
53 'POKE 298,0:POKE303,0 'DISABL
ES EXTENDED BASIC
55 'POKE360,162:POKE361,191 'ENA
BLES SCREEN PRINT
60 Q$=CHR$(34)'QUOTATION MARKS
70 CLS:PRINT@228,"PRESS "Q$"ENTE
R"Q$"FOR SCREEN ":PRINT@260,"PRE
SS "Q$"P"Q$" FOR HARD COPY"
80 A$=INKEY$:IFA$=""THEN80
90 IFA$<>"P"THEN D=0:X=4:Y=10:Z=
31:WIDTH=32 ELSE D=-2:X=30:Y=40:
Z=60:WIDTH=80
94 IFA$<>"P"THENA$="SCREEN"ELSEA
$="PRINTER"
95 PRINT@324,"PRESS 'D' FOR DISK
 FILE"
96 B$=INKEY$:IFB$="D"THEND=+1:OP
EN"O",#1,A$ ELSEIFB$=""THEN96
100 ITEM$="OUTSTANDING CHECKS"
110 UNIT=1
120 DATA 89,FEB 29,100
130 DATA 999,APR 15,21.35
140 DATA 1000,APR 16,1872.99
150 DATA 1001,APR 18,21.90
160 DATA 9999,EOF,0
170 CLS:PRINT#D,TAB((WIDTH-LEN(I
TEMS$))/2)ITEM$:PRINT#D," "
180 PRINT#D,TAB(X-3)"NO.";TAB(Y+
1)"DATE";TAB(Z-6)"AMOUNT":PRINT#
D," "
190 READ CHECKS$,DATE$,AMOUNT
200 IF DATE$="EOF"THEN260
210 SUM=SUM+AMOUNT
220 COUNTER=COUNTER+UNIT
230 N=AMOUNT:GOSUB1010
240 PRINT#D,TAB(X-LEN(CHECK$))CH
ECK$;TAB(Y)DATE$;TAB(Z-LEN(N$))N
$
250 GOTO190
260 N=SUM:GOSUB1010
270 PRINT#D:PRINT#D,TAB(X)COUNT"
CHECKS"
280 PRINT#D,TAB(X)"TOTAL AMOUNT"
TAB(Z-LEN(N$)-1)"$"N$
285 POKE360,130:POKE361,115 'DIS
ABLES SCREEN PRINT
288 POKE298,25:POKE303,14 'ENABL
ES EXTENDED BASIC WITH DISK BASI
C
290 CLOSE:END
1000 REM ** PRINT USING NUMBER F
ORMATTER **
1010 N$=STR$(INT((N+.005)*100))
1020 IFLEN(N$)>6THEN1050
1030 N$=MID$(N$,2,LEN(N$)-3)+"."
+RIGHT$(N$,2)
1040 GOTO1060 'ALTERNATE 1040 RE
TURN
1050 N$=MID$(N$,2,LEN(N$)-6)+","
+MID$(N$,LEN(N$)-4,3)+"."+RIGHT$
(N$,2)
1060 RETURN
```

Computer Simulation For Fun And Prophet

Part II: Exogenous Human Interaction Simulation — The *Stock Market*

By Dr. Bob Tyson

"Oh, I can do better than that!" We've all said that one time or another. "If I were the teacher . . . If I were the Commander-in-Chief . . . If I were the pole sitter . . . ." Computer Simulations give us the opportunity to prophesy our capability if we were someone that we might never be. "The pilot, the astronaut, the quarterback, are all possibilities if we let the computer do the work for us by just acting as "the other side." Part one of this series, last month, dealt with the components of a Simulation and how prophecy-by-computer is accomplished. The universe and the initial boundary conditions were defined so that anyone with an idea, a computer, and a little programming ability might be able to write a Simulation. One of the most difficult tasks in any Simulation is the art of simulating human thought or the world's reactions to our human thought. This article describes a few of the details of simulating human thought with emphasis on seeing how we might do if conditions were not known in a stock market Simulation.

After deciding what you want to simulate, defining your universe, and setting your initial and final boundary conditions, you can begin to simulate the human thought processes that go into your Simulation. There are two types of simulated human thought. One is called endogenous, which means "from within." An endogenous Simulation is one which lets the program do "the thinking." In an exogenous ("from without") Simulation, the player runs the program and does the thinking. Both are equally difficult to do. Endogenous Simulations are limited by their universe. They can only *think* certain things. They are not complete human brains. On the other hand, an exogenous Simulation will let the "player" think anything, but the computer programmer must have anticipated every possible thought that may arise.

I say these are equally difficult after examining my *Strategy Football* Simulation. In it, the program had both endogenous and exogenous human thought Simulations. The endogenous part came about when the computer had to play one of the teams. It chose plays, punts and onside kicks based on my own perception of the need for certain plays. I programmed it so that it would not try to kick a 95 yard field goal since that wasn't reasonable. One of the bugs in the published version of the Simulation allowed a very good chance of success for a 95-yard field goal. The exogenous part, the part where the player entered the plays, allowed for that possibility. Thus, a go-for-broke player might just try such an absurd thing and be successful. That, unfortunately, was the case. The universe for the exogenous human interaction just was not well enough defined. That is a pitfall in any complicated human thought Simulation.

Some endogenous thinking can be done with random numbers. For instance, if the best play to call would be a punt, but one out of 15 times, a forward pass might be successful, the computer could simply generate a random number *RND(15)* and see if it was equal to 1. If so, it would run the unlikely, but surprising play. Another approach to programming endogenous human thought is the *IF* statement. These can be quite complicated. For instance a chess Simulation — which is the epitome of human thought Simulations — generally runs through dozens of *IF . . . THEN* type statements (in BASIC or Machine Language) before it decides on the best one. It loses because the programmer didn't have the right one in there, not because it made a mistake. The state-of-the-art of endogenous human thought Simulations is called "artificial intelligence," which I will be writing about next month. The crux of this month's article is really exogenous human thought Simulation which is the basis for the *Stock Market* Simulation.

(Dr. Bob Tyson is a senior systems engineer at United Technologies Research Center, where he designs and analyzes high energy laser systems using computer simulations. His CoCo Simulations include Strategy Football *[August 1983 issue] and* Election '84 *[November 1983 issue].)*

The *Stock Market* Simulation

Key in the listing shown or load it from RAINBOW ON TAPE. It takes more than 16K after it is run. The Simulation allows up to five players to test their skill buying and selling securities as the market rises and falls. If you think you are a latter-day E.F. Hutton then this Simulation, since it is exogenous, lets you prove it. This is more than a simple buy low-sell high Simulation . . . everybody writes those. This program allows buying and selling stocks, short selling, options (puts and calls), borrowing against the prime rate, and the purchase of fixed rate bonds. It also provides a description of 10 different stocks along with a plot of their performance at any time.

The universe for this Simulation is the 10 stocks from 10 diverse companies, fixed rate bonds, up to seven options-to-buy, borrowing and paying on a debt, exercising the option-to-buy, and long and short selling on the 10 stocks. The Simulation provides for stock splitting and bankruptcies. If you don't know exactly what I'm talking about, just play it with buying and selling and buy a book on the subject, or ask a teacher or a broker, then let them play it and see how well they do. Most importantly, enjoy yourself. You just might learn something.

The Simulation is menu driven. After watching the logo when all the data arrays are initialized in lines 10-90, the main menu will appear. This will step through the players with the "day" shown on the screen. The "day" really simulates about two weeks in an actual market like the New York Stock Exchange. However, if you change the names and initial conditions in Lines 9000-9017 you can simulate any exchange. If you try a commodities exchange, my computer "day" simulates only a few minutes. Each player has many options (not to be confused with his "options" listed). He can look at his own portfolio; this tells him what he owns and what he owes. It also tells him the condition of any option that he owns. From the main menu, any player can review the current market status. This will tell him the current price of the 10 stocks and their high and low value over the last 12 days. (Remember a "day" is not a *day*.) The current market status menu will also tell you the prime rate, the market average, and the increase or decrease from the last period. From this menu, you can also get a "description" of each stock. The description routine will ask you for the ticker symbol of the stock (that's a three-letter abbreviation). It will give you a brief market analysis and a graphic plot of its performance over the last 12 days. The number on the upper left of the plot is the maximum of the vertical axis. It's also a clue to when the stock might split. This is useful when you've got a half dozen stocks floating around and you forgot what they were. From this menu you can also get a list of the options for sale. You can't purchase or sell anything from this menu, you can just get information.

From the main menu you can choose to place an order. This will allow you to buy, sell, and do just about everything except call Merrill Lynch. Investing allows you to buy a stock at its current market price and pay the commission. The Simulation will tell you how many shares you can afford and then prompt you for the number of shares you wish to buy.

Don't enter fractional or negative shares; it was debugged, but I'm not perfect. Divesting allows you to sell shares, also with the commission fee. If you don't own any, the Simulation will stop you. After all, the Securities and Exchange Commission must do its job.

A "short sell" is a gamble that the stock price will go down, rather than up. If you short sell a stock you essentially borrow the shares and sell them. This money is added to your cash on hand. The shares will show up in your portfolio with an 'S' beside them (for Short). If you bought the shares outright, by INVESTING, the shares will have an "L" beside them in the portfolio (for Long). This looks like a way to borrow money, and it is, but it really becomes a debt you incurred. Cancelling the short sell is the opposite. You must have enough cash to "buy back" the shares that you borrowed. If you want to cancel the short sale, just borrow enough to buy back all the shares, and then do it. This Simulation Universe doesn't allow someone to own a stock "long" and "short" at the same time. If you can't decide whether it's going up or down, I can't either.

Another investing trick of the trade is the "option." This Simulation provides only for an option-to-buy. The option-to-sell just makes it that much more complicated. When you purchase an option, you purchase a chance to buy the stock at a fixed price before a fixed expiration date. All this is spelled out on the option. If the price of the stock goes above the option price then you should exercise the option and "buy the stock at a bargain." If nothing happens before the option expires, just let it die. The price of the option is always much less than the price of the shares. In real life you could also sell the option itself, since it has value. But, in this Simulation you must "exercise it" to buy the shares and then take your profit by selling them.

Sooner or later you may need more money. You can simply borrow what you need here. The rate is based on the prime interest rate that is shown. But, as in real life, the more you borrow, the lower the rate becomes. Don't overdo it; you can easily go into debt too far. At any time you can also pay back all or part of the loan. That will save you a lot of interest.

The last player has an extra choice at his main menu. He, or she, can EXIT to see the results. This ends the Simulation. You can compare yourself with the other players by looking at your total net worth. If the last player decides to continue to the next "day" they just press 'G'. The Simulation will then do all the updating. This takes place in lines beginning with 5000. The new stock prices are computed based on bull (rising) or bear (falling) market conditions. The new averages are computed. The arrays holding the stock price histories are updated. If a stock price has gone too high, depending on its market analysis, it will split. This is where each owner of the stock will get two shares for each one he owns *and* the price of the stock will be halved. By itself, it is meaningless, but say, for instance, that the stock rises, on the average, $2 a day. If the stock sells for $20/share that's 10 percent. But now, if it splits, and the price goes to $10/share the same $2 increase amounts to 20 percent. In general, if you own a stock when it splits, that's good. On the other hand, if the stock price goes to zero, the company becomes bankrupt. Any shares that you hold are generally worthless, but the Simulation gives you a break, it only takes 90 percent of your unfortunate shares. The company will start over, cautiously.

Also during the update period, dividends are paid to owners of stock. You will be able to see this by your cash increase. If you have any outstanding debt, the bank will deduct the interest and you will see a cash decrease. All these operations are automatic since the broker and banker of the Simulation are endogenous.

Good luck, capitalists. Don't let greed and longing for power overcome your senses. This mainly exogenous Simulation doesn't have a conscience. The prophecy you make may be your own.

100	89	5310	251
2070	162	6200	24
3270	117	8106	20
3450	30	8850	119
3690	148	9006	233
3898	41	END	113

The listing:

```
10 DIM S(5,24),V(11,7),OP(7,6),N
$(5),T$(10),PH(10,24)
15 CLS0:PRINT@132," S T O C K
M A R K E T ";:PRINT@196," SIMUL
ATION BY BOB TYSON ";
17 I$="% %% %######%     %$$#,###,#
##.##"
20 PMODE 3,1:PCLS(1):COLOR 2,4
21 LINE (10,180)-(230,20),PSET,B
F:COLOR 3,4:LINE(10,180)-(230,20
),PSET,B
22 DRAW"BM20,30;R20L20D20R20D20L
20;BR40U40L10R16;BR10D40R20U40L2
0;BR50L20D40R20;BR10U40D20R7E14G
14F14D7"
23 DRAW"BM10,160;E40F10E25F20E50
F20E22F8E25":PAINT(190,175),4,3
24 DRAW"BM50,172;U40F10E10D40;BR
10U40R20D20L20R20D20;BR10U40R20D
20L20R14D3R3D3R3D14;BR10U40D20R7
E14G14F14D7;BR10R20L20U20R14L14U
20R20;BR10R20L10D40"
25 SCREEN 1,0:FOR X=1 TO 10:GOSU
B 9900:NEXT
29 SCREEN 0,0:CLS::PRINT"ENTER N
UMBER OF PLAYERS 1-5":INPUT NP

30 DA=1:P=1:PR=11+RND(20)/10:DN=
1
35 IF NP<0 OR NP>5 THEN 29
40 FOR S=1 TO 10:READ V(S,1):V(S
,2)=V(S,1):V(S,4)=V(S,1):READ V(
S,6),V(S,7):NEXT:FOR I=1 TO 7:RE
AD V(11,I):NEXT
50 FOR PP=1 TO NP:FOR I=1 TO 24:
S(PP,I)=0:NEXT I:S(PP,22)=25000:
NEXT PP
60 LA=0:FOR S=1 TO 10:FOR X=1 TO
 12:PH(S,X)=V(S,1):PH(S,X+12)=0:
NEXT X:LA=LA+V(S,1):NEXT S:LA=LA
/10:DN=10
70 FOR PP=1 TO NP:CLS:PRINT @65,
"ENTER NAME OF PLAYER ";PP,"":IN
PUT N$(PP):NEXT PP
```

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```
80 FOR S=1 TO 10:READ T$(S):NEXT
 S
90 GOSUB 8400:LA=AV:FOR I=1 TO 7
:OP(I,6)=-1:NEXT I:GOSUB 8700
100 CLS3:PRINT @40," M E N U ";
101 PRINT @102," "+N$(P)+" ";:PR
INT @134," DAY= ";DA;" "
102 PRINT @160,"          V -- VIEW
PORTFOLIO             C -- CURRE
NT MARKET STATUS       P -- PLACE
 ORDER          ";
103 IF P=NP THEN PRINT"          G
-- GO TO NEXT WEEK             X
-- EXIT TO SEE RESULTS "; ELSE P
RINT"        G -- GO TO NEXT PLAY
ER    "
110 K$=INKEY$:IF K$="" THEN 110
ELSE IF K$="V" THEN 1000 ELSE IF
 K$="C" THEN 2000 ELSE IF K$="P"
 THEN 3000 ELSE IF K$="X" THEN 8
000 ELSE IF (K$="G" AND P=NP) TH
EN 5000 ELSE IF (K$="G" AND P<>N
P) THEN 4000 ELSE 110
1000 CLS:PRINT N$(P)
1010 PRINT"ITEM    SHARES TYPE VA
LUE "
1020 FOR S=1 TO 10
1030 IF S(P,S)<>0 THEN 1050
1040 IF S(P,S+10)<>0 THEN 1070 E
LSE 1100
1050 PRINT USING I$;T$(S);"    ";
S(P,S);"   L ";S(P,S)*V(S,1)
1060 GOTO 1100
1070 PRINT USING I$;T$(S);"    ";
S(P,S+10);"    S ";S(P,S+10)*V(S,
1)
1100 NEXT
1110 IF S(P,21)<>0 THEN 1120 ELS
E 1130
1120 PRINT USING"%      %#####% %$
$#,###,###.##";"BONDS ";S(P,21);
"    ";S(P,21)*1000
1130 PRINT USING"%      %%      %$
$#,###,###.##";"CASH   ";"
 ";S(P,22)
1140 PRINT USING"%      %%      %$
$#,###,###.##";"DEBT   ";"
 ";S(P,23)
1150 X=0:FOR S=1 TO 10:X=X+(S(P,
S)-S(P,S+10))*V(S,1):NEXT
1160 X=X+1000*S(P,21)+S(P,22)-S(
P,23)
1170 PRINT USING"%              %$
$###,###.##";"TOTAL VALUE    ";X
1175 IF S(P,22)>0 THEN 1180 ELSE
 PRINT"YOU MUST BORROW FUNDS":GO
SUB 9900:GOTO 3400
1180 PRINT"<M> FOR MENU, <P> TO
PLACE ORDER  <N> TO VIEW OPTION
OWNED"
1190 K$=INKEY$:IF K$="" THEN 119
0 ELSE IF K$="N" THEN 1200 ELSE
IF K$="M" THEN 100 ELSE IF K$="P
" THEN 3000 ELSE 1190
1200 I=1
1210 IF OP(I,6)=P THEN 1240
1220 I=I+1:IF I<8 THEN 1210 ELSE
 1230
1230 PRINT"YOU OWN NO OPTIONS":G
OSUB 9900:GOTO 100
1240 PRINT"YOU OWN AN OPTION TO
BUY":PRINT OP(I,2);" SHARES OF "
;T$(OP(I,1)):PRINT"AT $";OP(I,3)
;"/SHARE":PRINT"EXPIRES ON ";OP(
I,4)
1250 GOTO 1180
2000 CLS:PRINT"  C U R R E N T
 M A R K E T"
2010 PRINT"ITEM HIGH...    LOW...
  CLOSE..."
2020 FOR S=1 TO 10
2025 GOSUB 8800
2030 VV=V(S,2):GOSUB 8100:X$=K$:
X=VI:V(S,2)=VV
2040 VV=V(S,4):GOSUB 8100:Y$=K$:
Y=VI:V(S,4)=VV
2050 VV=V(S,1):GOSUB 8100:Z$=K$:
Z=VI:V(S,1)=VV
2070 PRINT USING"%  %###%     %##
#%    %###%     %";T$(S)+" ";X;X$
;Y;Y$;Z;Z$
2080 NEXT S
2090 PRINT "BONDS
$ 1000"
2100 PRINT "PRIME=";PR;" % ";:GO
SUB 8400:PRINT USING"%       %###
#.##";"AVERAGE ";AV
2107 X=INT(ABS(AV-LA)*1000)/1000
:IF AV>LA THEN K$=" UP "+STR$(X)
 ELSE IF AV<LA THEN K$=" DOWN "+
STR$(X) ELSE K$="NO CHANGE"
2108 PRINT K$
2110 PRINT"<M> MENU,<D> DESCR.,<
V> OPTIONS";
2120 K$=INKEY$:IF K$="" THEN 212
0 ELSE IF K$="M" THEN 100 ELSE I
F K$="D" THEN 6000 ELSE IF K$="V
" THEN 2200 ELSE 2120
2200 GOSUB 2300
2210 GOTO 2110
2300 CLS:PRINT"OPTIONS AVAILABLE
"
2310 FOR I=1 TO 7
2320 IF OP(I,6)<>0 THEN 2350
2330 PRINT "#";I;"-";OP(I,2);" S
HARES OF ";T$(OP(I,1))
2335 PRINT "AT $";OP(I,3);"/SH :
 EXPIRES ";OP(I,4)
```

```
2340 PRINT"OPTION COSTS $";OP(I,
5)
2345 PRINT"HIT KEY FOR NEXT"
2346 K$=INKEY$:IF K$="" THEN 234
6 ELSE 2350
2350 NEXT I
2360 RETURN
3000 CLS:PRINT" P L A C E   O R
D E R "
3010 PRINT:PRINT"<I> INVEST(BUY)
                 <D> DIVEST(SELL
)                <S> SHORT SELL
                 <C> CANCEL SHOR
T SELL"
3015 PRINT"<N> PURCHASE OPTION
           <E> EXERCISE OPTION
           <B> BORROW FUNDS
           <T> PAY TOWARDS DEBT"
3020 PRINT:PRINT"<M> MENU
                 <P> PLACE ANOTH
ER ORDER"
3030 K$=INKEY$:IF K$=""THEN 3030
 ELSE IF K$="I" THEN 3100 ELSE I
F K$="D" THEN 3200 ELSE IF K$="S
" THEN 3300 ELSE IF K$="B" THEN
3400
3040 IF K$="T" THEN 3500 ELSE IF
 K$="M" THEN 100 ELSE IF K$="P"
THEN 3000 ELSE IF K$="C" THEN 36
00 ELSE IF K$="N" THEN 3700 ELSE
 IF K$="E" THEN 3800 ELSE 3030
3100 CLS:PRINT" I N V E S T I N
G"
3110 PRINT "CURRENT CASH AVAILAB
LE $";S(P,22)
3120 GOSUB 8200
3122 IF S=0 THEN 3120
3125 IF S=11 THEN VV=0 ELSE VV=V
(S,1)
3126 IF S<>11 AND S(P,10+S)<>0 T
HEN 3199 ELSE GOSUB 8100
3128 IF S=11 THEN 3130 ELSE PRIN
T "CURRENT PRICE IS ";VI;K$
3129 X=INT(INT(S(P,22)/V(S,1)/10
0)*100)-100:PRINT"YOU CAN AFFORD
 ";X;" SHARES":GOTO 3140
3130 X=INT(S(P,22)/1000)-1:PRINT
 "CURRENT PRICE IS $1000.00 EACH
":PRINT"YOU CAN AFFORD ";X;" BON
DS"
3140 PRINT"HOW MANY DO YOU WISH
TO BUY?":INPUT NS:GOSUB 8600:IF
FLAG=1 THEN 3129 ELSE IF NS>X TH
EN 3140
3150 DL=NS*V(S,1):GOSUB 8500
3155 CV=INT(DL+CM*DL/100)
3160 PRINT "YOUR COST IS $";CV:P
RINT"INCLUDING A ";CM;" % COMMIS
SION"
```

```
3170 PRINT"VERIFY SALE (Y/N)"
3180 K$=INKEY$:IF K$="" THEN 318
0 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3190 ELSE 3180
3190 IF S=11 THEN S(P,21)=S(P,21
)+NS
3192 IF S<11 AND S>0 THEN S(P,S)
=S(P,S)+NS
3194 S(P,22)=S(P,22)-CV
3198 GOTO 100
3199 PRINT"YOU OWN THESE SHARES
SHORT, YOU CANNOT BUY THEM LONG"
:GOSUB 9900:GOSUB 9900:GOTO 100
3200 CLS:PRINT" D I V E S T I N
G"
3210 GOSUB 8200:IF S=0 THEN 3210
3220 IF S=11 THEN 3250
3230 IF S(P,S)=0 THEN 3231 ELSE
3235
3231 PRINT "YOU DO NOT OWN ANY S
HARES":GOSUB 9900:GOTO 100
3235 PRINT "YOU OWN ";S(P,S);" S
HARES @";:VV=V(S,1):GOSUB 8100:P
RINT VI;K$
3240 X=S(P,S):GOTO 3260
3250 X=S(P,21):VV=V(11,1)
3260 PRINT"HOW MANY DO YOU WISH
TO SELL?":INPUT NS:GOSUB 8600:IF
 FLAG=1 THEN 3235
3270 IF X<NS THEN 3260
3275 DL=NS*VV:GOSUB 8500
3280 CV=DL-CM*DL/100
3285 PRINT"YOUR REVENUE IS $";CV
:PRINT"INCLUDING A ";CM;" % COMM
ISSION":PRINT"VERIFY SALE (Y/N)"
3287 K$=INKEY$:IF K$="" THEN 328
7 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3290 ELSE 3287
3290 IF S=11 THEN S(P,21)=S(P,21
)-NS
3291 IF S<11 AND S>0 THEN S(P,S)
=S(P,S)-NS
3292 S(P,22)=S(P,22)+CV
3294 GOTO 100
3300 CLS:PRINT" SHORT SELL A COM
MON STOCK"
3320 GOSUB 8200
3322 IF S=0 OR S=11 THEN 3320
3323 IF S(P,S)>0 THEN 3325
3324 VV=V(S,1):GOSUB 8100:GOTO 3
328
3325 PRINT"YOU CAN NOT SHORT SEL
L A STOCK  THAT YOU OWN LONG; YO
U HAVE":PRINT S(P,S);" SHARES OF
 IT":GOSUB 9900:GOTO 100
3328 PRINT "CURRENT PRICE IS ";V
I;K$
3340 PRINT"HOW MANY DO YOU WISH
TO SHORT   SELL?":INPUT NS
```

```
3350 DL=NS*V(S,1):GOSUB 8500
3355 CV=DL-CM*DL/100
3360 PRINT "YOUR GAIN IS $";CV:P
RINT"INCLUDING A ";CM;" % COMMIS
SION"
3370 PRINT"VERIFY SALE (Y/N)"
3380 K$=INKEY$:IF K$="" THEN 338
0 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3390 ELSE 3380
3390 S(P,S+10)=S(P,S+10)+NS
3394 S(P,22)=S(P,22)+CV
3398 GOTO 100
3400 CLS:PRINT" B O R R O W I N
G"
3410 PRINT:PRINT"THE PRIME RATE
IS ";PR;" %"
3420 PRINT"HOW MUCH DO YOU WISH
TO BORROW?":INPUT NS:IF NS<0 THE
N 3420
3424 IF NS=0 THEN 100
3425 IF NS>100000 THEN X=PR ELSE
 X=PR+1.5
3430 CV=NS*X*.01/26:PRINT"YOUR B
IWEEKLY INTEREST PAYMENT  WILL B
E ";:PRINT USING"$#####.##";CV
3440 PRINT"VERIFY TRANSACTION (Y
/N)"
3450 K$=INKEY$:IF K$="" THEN 345
0 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3460 ELSE 3450
3460 S(P,24)=(S(P,24)*S(P,23)+X*
NS)/(S(P,23)+NS):S(P,23)=S(P,23)
+NS:S(P,22)=S(P,22)+NS
3470 GOTO 100
3500 CLS:PRINT" PAYMENT ON DEBT"
3505 PRINT:PRINT"YOU OWE $";S(P,
23)
3510 PRINT"HOW MUCH DO YOU WISH
TO PAY?":INPUT NS:IF NS<S(P,22)
THEN 3525
3520 PRINT"YOU DON'T HAVE THAT M
UCH...       YOU ONLY HAVE $";S(P,
22):GOSUB 9900:GOTO 3510
3525 IF NS<S(P,23) THEN 3530 ELS
E PRINT"YOU DON'T OWE THAT MUCH
3526 GOSUB 9900:GOTO 3510
3530 PRINT"THAT WILL LEAVE YOU W
ITH $";S(P,22)-NS
3540 PRINT"THE PRIME RATE IS ";P
R;" %"
3550 PRINT"VERIFY SALE (Y/N)"
3560 K$=INKEY$:IF K$="" THEN 356
0 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3570 ELSE 3560
3570 S(P,22)=S(P,22)-NS:S(P,23)=
S(P,23)-NS:GOTO 100
3600 CLS:PRINT" CANCEL A SHORT S
OLD STOCK"
3620 GOSUB 8200
3622 IF S=0 OR S=11 THEN 3620
3623 IF S(P,S+10)=0 THEN 3625
3624 VV=V(S,1):GOSUB 8100:GOTO 3
628
3625 PRINT"YOU DO NOT HAVE ANY S
HARES THAT ARE SHORT SOLD":GOSUB
 9900:GOTO 100
3628 PRINT "CURRENT PRICE IS ";V
I;K$
3630 X=INT(INT(S(P,22)/V(S,1)/10
0)*100)-100:IF X>S(P,S+10)THEN X
=S(P,S+10)
3635 PRINT"YOU CAN AFFORD ";X;"
SHARES"
3640 PRINT"HOW MANY DO YOU WISH
TO BUY       BACK?":INPUT NS:GOSUB
 8600:IF FLAG=1 THEN 3630 ELSE I
F NS>X THEN 3640
3650 DL=NS*VV:GOSUB 8500
3660 CV=DL+CM*DL/100
3662 PRINT "YOUR COST IS $";CV:P
RINT"INCLUDING A ";CM;" % COMMIS
SION"
3670 PRINT"VERIFY SALE (Y/N)"
3680 K$=INKEY$:IF K$="" THEN 368
0 ELSE IF K$="N" THEN 100 ELSE I
F K$="Y" THEN 3690 ELSE 3680
3690 S(P,S+10)=S(P,S+10)-NS
```

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```
3694 S(P,22)=S(P,22)-CV
3698 GOTO 100
3700 K=0
3701 FOR I=1 TO 7:IF OP(I,6)=P T
HEN K=I
3702 NEXT I
3703 IF K=0 THEN 3709 ELSE 3704
3704 PRINT"YOU OWN AN OPTION ALR
EADY":GOSUB 9900:GOTO 100
3709 GOSUB 2300
3710 PRINT"CHOOSE OPTION # , 0 F
OR MENU"
3720 INPUT I:IF I<=0 THEN 100
3730 IF OP(I,5)<S(P,22) THEN 375
0
3740 PRINT"YOU CAN'T AFFORD IT":
GOSUB 9900:GOTO 100
3750 OP(I,6)=P:S(P,22)=S(P,22)-O
P(I,5)
3760 GOTO 100
3800 CLS:K=0
3810 FOR I=1 TO 7:IF OP(I,6)=P T
HEN K=I
3820 NEXT I
3830 IF K=0 THEN 3840 ELSE 3850
3840 PRINT"YOU OWN NO OPTIONS":G
OSUB 9900:GOTO 100
3850 IF S(P,OP(K,1)+10)<>0 THEN
3898
3860 X=OP(K,2)*OP(K,3):Y=OP(K,2)
*V(OP(K,1),1)
3865 IF X>S(P,22) THEN 3740
3870 PRINT "YOUR COST IS $";:PRI
NT USING"######.##";X
3880 PRINT "MARKET PRICE IS $";:
PRINT USING"######.##";Y
3890 PRINT"VERIFY OPTION SALE (Y
/N)"
3895 K$=INKEY$:IF K$="" THEN 389
5 ELSE IF K$="Y" THEN 3896 ELSE
100
3896 S(P,22)=S(P,22)-X:S(P,OP(K,
1))=S(P,OP(K,1))+OP(K,2)
3897 OP(K,6)=-1:GOTO 100
3898 PRINT"YOU OWN THIS STOCK SH
ORT          CANCEL THE SHORT SELL
 FIRST":GOSUB 9900:GOSUB 9900:GO
TO 100
4000 P=P+1:IF P=NP+1 THEN 5000
4001 GOTO 100
5000 CLS:DA=DA+1:P=1:Z=RND(0)
5005 IF Z>.7 THEN 5008 ELSE IF Z
<.3 THEN 5007 ELSE 5006
5006 PRINT"MIXED MARKET":GOSUB 9
900:GOTO 5010
5007 PRINT"BEAR MARKET":GOSUB 99
00:GOTO 5010
5008 PRINT"BULL MARKET":GOSUB 99
00:GOTO 5010
5010 FOR S=1 TO 10
5020 M=V(S,1)+Z*V(S,6):V=V(S,6)
5030 GOSUB 8300
5040 V(S,1)=T:V(S,3)=T:PH(S,24)=
0
5050 IF V(S,1)<=0 THEN 5100 ELSE
 IF V(S,1)>V(S,7) THEN 5200
5060 NEXT S
5070 FOR X=1 TO NP  'DEDUCT INTE
REST
5080 Y=S(X,23)*S(X,24)/2600
5090 S(X,22)=S(X,22)-Y:IF S(X,22
)>0 THEN 5096
5092 S(X,23)=S(X,23)+Y
5096 NEXT X
5098 GOTO 5300
5100 V(S,1)=0:V(S,3)=0:PRINT T$(
S);" DECLARED BANKRUPCY":PRINT"T
EMPORARY HALT IN TRADING; ALL  S
HAREHOLDERS ARE PAID 1 SHARE    F
OR EACH 10 CURRENTLY OWNED."
5110 GOSUB 9900:GOSUB 9900
5120 FOR X=1 TO NP
5140 IF S(X,S)<>0 OR S(X,S+10)<>
0 THEN 5150 ELSE 5180
5150 S(X,S)=INT(S(X,S)/10):S(X,S
+10)=INT(S(X,S+10)/10)
5180 NEXT X
```

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```
5190 GOTO 5060
5200 V(S,1)=V(S,1)/2:PRINT T$(S)
;" SPLIT 2 FOR 1"
5210 GOSUB 9900:PH(S,24)=1
5220 FOR X=1 TO NP
5230 IF S(X,S)<>0 OR S(X,S+10)<>
0 THEN 5240 ELSE 5250
5240 S(X,S)=2*S(X,S):S(X,S+10)=2
*S(X,S+10)
5250 NEXT X
5260 GOTO 5060
5300 LA=AV:FOR I=1 TO 10:T=V(I,1
):V(I,1)=V(I,3):V(I,3)=T:NEXT
5310 GOSUB 8400:FOR I=1 TO 10:T=
V(I,1):V(I,1)=V(I,3):V(I,3)=T:NE
XT
5320 X=0:FOR I=1 TO 10:X=X+V(I,1
):NEXT
5330 DN=X/AV
5340 FOR S=1 TO 10:FOR I=2 TO 12
:PH(S,I-1)=PH(S,I):PH(S,I+11)=PH
(S,I+12):NEXT I:PH(S,12)=V(S,1):
NEXT S
5350 FOR S=1 TO 10
5352 V(S,2)=0:V(S,4)=500
5354 FOR I=1 TO 12
5356 IF PH(S,I)>V(S,2) THEN V(S,
2)=PH(S,I)
5358 IF PH(S,I)<V(S,4) THEN V(S,
4)=PH(S,I)
5360 NEXT I
5370 FOR I=1 TO NP
5380 S(I,22)=S(I,22)+3.85*S(I,21
)
5390 NEXT I
5400 IF (2*INT(DA/2)<>DA) THEN 5
440
5410 FOR I=1 TO NP:FOR X=1 TO 10
5420 S(I,22)=S(I,22)+V(X,1)*S(I,
X)/(1200*V(X,6))
5430 NEXT X
5432 NEXT I
5440 FOR I=1 TO 7
5450 IF DA>OP(I,4) THEN OP(I,6)=
-1
5460 NEXT I
5470 GOSUB 8700
5471 FOR S=1 TO 10:IF V(S,1)=0 T
HEN V(S,1)=10
5472 NEXT S
5480 GOTO 100
6000 GOSUB 8200
6050 RESTORE:FOR X=1 TO 37:READ
Y:NEXT:FOR X=1 TO 10:READ K$:NEX
T
6060 FOR X=1 TO S:READ K$:NEXT
```

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```
6070 CLS:PRINT K$:PRINT:PRINT "<
M> FOR MENU, <P> FOR PLOT"
6080 K$=INKEY$:IF K$="" THEN 608
0 ELSE IF K$="P" THEN 6100 ELSE
IF K$="M" THEN 100 ELSE 6080
6100 IF S=11 THEN 100 ELSE PMODE
 3,1:PCLS(1):SCREEN 1,0:COLOR 3,
2 'S=# OF STOCK V(S,7) IS MAXI
MUM
6110 LINE(10,180)-(230,20),PSET,
BF
6115 COLOR 2,3
6120 FOR I=10 TO 230 STEP 20
6130 LINE(I,176)-(I,180),PSET:NE
XT I
6140 X=10:Y=180-160*PH(S,1)/V(S,
7)
6150 FOR I=2 TO 12
6160 V=(I-1)*20+10:Z=180-160*PH(
S,I)/V(S,7)
6170 LINE(X,Y)-(V,Z),PSET
6180 X=V:Y=Z
6190 NEXT I
6192 COLOR 3,2
6193 DRAW"BM180,1"
6195 ON S GOTO 6200,6220,6240,62
60,6280,6300,6320,6340,6360,6380
6200 GOSUB 8901:GOSUB 8907:GOSUB
 8911:DRAW"BM10,1":GOSUB 8924:GO
SUB 8925:GOTO 6500
6220 GOSUB 8903:GOSUB 8911:GOSUB
 8912:DRAW"BM10,1":GOSUB 8925:GO
SUB 8920:GOTO 6500
6240 GOSUB 8904:GOSUB 8918:GOSUB
 8910:DRAW"BM10,1":GOSUB 8929:GO
SUB 8920:GOTO 6500
6260 GOSUB 8909:GOSUB 8909:GOSUB
 8908:DRAW"BM10,1":GOSUB 8925:GO
SUB 8920:GOTO 6500
6280 GOSUB 8910:GOSUB 8916:GOSUB
 8909:DRAW"BM10,1":GOSUB 8924:GO
SUB 8920:GOSUB 8920:GOTO 6500
6300 GOSUB 8913:GOSUB 8911:GOSUB
 8910:DRAW"BM10,1":GOSUB 8922:GO
SUB 8925:GOTO 6500
6320 GOSUB 8913:GOSUB 8917:GOSUB
 8903:DRAW"BM10,1":GOSUB 8922:GO
SUB 8925:GOSUB 8920:GOTO 6500
6340 GOSUB 8914:GOSUB 8909:GOSUB
8906:DRAW"BM10,1":GOSUB 8921:GOS
UB 8920:GOSUB 8920:GOTO 6500
6360 GOSUB 8915:GOSUB 8901:GOSUB
 8902:DRAW"BM10,1":GOSUB 8925:GO
SUB 8920:GOTO 6500
6380 GOSUB 8916:GOSUB 8907:GOSUB
 8905:DRAW"BM10,1":GOSUB 8922:GO
SUB 8925:GOTO 6500
6500 FOR I=1 TO 12
6510 IF PH(S,12+I)<>1 THEN 6550
```

```
6530 CIRCLE((I-1)*20+10,10),4,4
6550 NEXT I
6560 K$=INKEY$:IF K$=""THEN 6560
 ELSE 100
8000 CLS:PRINT"COMPARATIVE RESUL
TS":PRINT"AFTER ";DA;" INVESTING
 PERIODS"
8010 FOR P=1 TO NP
8020 PRINT N$(P)
8030 X=0:FOR S=1 TO 10:X=X+(S(P,
S)-S(P,S+10))*V(S,1):NEXT
8040 X=X+1000*S(P,21)+S(P,22)-S(
P,23)
8050 PRINT USING"%            %$
$###,###.##";"TOTAL VALUE    ";X
8060 NEXT P
8070 END
8100 VI=INT(VV):VD=VV-VI:IF VD<1
/16 THEN 8110
8101 IF VD>=1/16 AND VD<3/16 THE
N 8120
8102 IF VD>=3/16 AND VD<5/16 THE
N 8130
8103 IF VD>=5/16 AND VD<7/16 THE
N 8140
8104 IF VD>=7/16 AND VD<9/16 THE
N 8150
8105 IF VD>=9/16 AND VD<11/16 TH
EN 8160
8106 IF VD>=11/16 AND VD<13/16 T
HEN 8170
8107 IF VD>=13/16 THEN 8180
8110 K$="      ":VD=.0:VV=VI+VD:
RETURN
8120 K$=" 1/8  ":VD=.125:VV=VI+V
D:RETURN
8130 K$=" 1/4  ":VD=.250:VV=VI+V
D:RETURN
8140 K$=" 3/8  ":VD=.375:VV=VI+V
D:RETURN
8150 K$=" 1/2  ":VD=.500:VV=VI+V
D:RETURN
8160 K$=" 5/8  ":VD=.625:VV=VI+V
D:RETURN
8170 K$=" 3/4  ":VD=.750:VV=VI+V
D:RETURN
8180 K$=" 7/8  ":VD=.875:VV=VI+V
D:RETURN
8200 CLS:S=0:PRINT "ENTER TICKER
 SYMBOL OF STOCK OR BOND"
8202 PRINT:FOR I=1 TO 5:PRINT T$
(I)+" ";:NEXT:PRINT T$(6)
8203 FOR I=7 TO 10:PRINT T$(I)+"
 ";:NEXT:PRINT" BONDS"
8208 INPUT K$
8210 FOR S=1 TO 10:IF K$=T$(S) T
HEN 8240
8220 NEXT S
8230 IF K$="BONDS" THEN S=11 ELS
```

```
E S=0
8240 RETURN
8300 'RANDOM NORMAL DISTRIBUTION
 T,M=MEAN,V=VARIANCE
8310 T=V*(RND(0)+RND(0)+RND(0)-1
.5)/.497 + M:RETURN
8400 AV=0:FOR I=1 TO 10:AV=AV+V(
I,1)/DN:NEXT:RETURN
8500 CM=5:IF DL>100000 THEN CM=2
 ELSE IF DL>10000 THEN CM=3.5
8510 RETURN
8600 IF NS<0 THEN FLAG=1 ELSE FL
AG=0
8610 RETURN
8700 FOR I=1 TO 7
8710 IF OP(I,6)<>-1 THEN 8780
8720 OP(I,6)=0:K=RND(10):OP(I,1)
=K
8730 OP(I,2)=100*RND(5):Y=RND(10
)+5:OP(I,3)=INT(V(K,1)+Y*V(K,6)/
2):OP(I,4)=DA+Y:OP(I,5)=INT(OP(I
,3)*OP(I,2)/100)
8780 NEXT I
8790 RETURN
8800 V(S,2)=0:V(S,4)=10000
8810 FOR I=1 TO 12
8820 IF PH(S,I)>V(S,2) THEN V(S,
2)=PH(S,I)
8830 IF PH(S,I)<V(S,4) THEN V(S,
4)=PH(S,I)
8840 NEXT I
8850 RETURN
8901 DRAW"BM+6,+0;R8D12U6L8D6U12
R8":RETURN
8902 DRAW"BM+6,+0;D12R6U2R2U4L8R
6U2R2U2L2U2L6BR8":RETURN
8903 DRAW"BM+6,+0;D12R8L8U12R8":
RETURN
8904 DRAW"BM+6,+0;D12R6U2R2U8L2U
2L6BR8":RETURN
8905 DRAW"BM+6,+0;D12R8L8U6R4L4U
6R8":RETURN
8906 DRAW"BM+6,+0;R4D12L4R8L4U12
R4":RETURN
8907 DRAW"BM+6,+0;R8L8D12R8U6L4D
2BU8L4R8":RETURN
8908 DRAW"BM+6,+0;D12R8BU12":RET
URN
8909 DRAW"BM+6,+0;D12U12F4E4D12U
12":RETURN
8910 DRAW"BM+6,+0;D12U12F4D4F4U1
2":RETURN
8911 DRAW"BM+6,+0;R8D6L8U6D12BR8
H6BE6":RETURN
8912 DRAW"BM+6,+0;D6R8D6L8BU12R8
":RETURN
8913 DRAW"BM+6,+0;R8L4D12U12R4":
RETURN
8914 DRAW"BM+6,+0;D10F2R4E2U10":
RETURN
8915 DRAW"BM+6,+0;D8F4E4U8":RETU
RN
8916 DRAW"BM+6,+0;D12E4F4U12":RE
TURN
8917 DRAW"BM+6,+0;F4D4G4BR8H4U4E
4":RETURN
8918 DRAW"BM+6,+0;F4D8U8E4":RETU
RN
8920 DRAW"BM+6,+0;D12R8U12L8R8":
RETURN
8921 DRAW"BM+6,+0;BR2;R2D12L2R4L
2U12;BR2":RETURN
8922 DRAW"BM+6,+0;R8D6L8D6R8BU12
":RETURN
8924 DRAW"BM+6,+0;D6R8L2D6U12BR2
":RETURN
8925 DRAW"BM+6,+0;D6R6F2D2G2L6BU
12R8":RETURN
8929 DRAW"BM+6,+0;D6R8D6U12L8R8"
:RETURN
9000 DATA 10,2,45,4,.2,50
9001 DATA 30,3,90,17,1,50
9002 DATA 40,10,400,6,.5,25
9003 DATA 34,6,250,20,2,100
9004 DATA 9,.5,50,8,.5,25
9005 DATA 1000,1000,0,1000,0,0,9
999
9006 DATA AGR,CRS,DYN,MML,NWM,TR
N,TXC,UMI,VAB,WGE
9007 DATA AGRICON FOODS
   AGR    STABLE GROWTH COMPANY
 DEALING  IN WHOLE GRAINS AND PR
OCESSED   FROZEN FOODS.  CAN BE
AFFECTED  BY WEATHER CONDITIONS.
9008 DATA CROSS DISCOUNT STORES
   CRS    CHAIN OF DISCOUNT DEP
ARTMENT   STORES. USUALLY SUBJEC
T OF LIGHTTRADING WITH VARIATION
S DUE TO  CONSUMER ECONOMIC SITU
ATIONS.
9009 DATA DYNATRONICS
   DYN    VERY VOLATILE HIGH TE
CHNOLOGY  GROWTH COMPANY.  SPECI
ALIZES IN MILITARY HARDWARE.
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is simply a very good, and very fun to play game. It has everything going for it: The challenge of trivia, ease of use, a good social game encouraging conversation, and you may even learn something! The development system (included) even lets you easily create your own custom question disks.

The play of the game is easy to understand, because the computer does all the work for you. It even looks up and presents the proper question!

On each question disk there are five categories, and there are an amazing 1100 questions on each disk. No, that's not a misprint, we said 1100 questions per question disk! Yes, that is a pretty full disk. Because the questions are stored on the disk, instead of in memory, you can play **COLOR DISK TRIVIA** on any size Color Computer system with one disk drive — 16K, 32K, or 64K.

There are already five question disks available, and you get the GENERAL disk when you purchase the game. That's correct, there are already FIVE question disks with a total of 5500 questions available for shipment RIGHT NOW, with more on the way shortly.

All question disks have five categories and 1100 questions. The disks available now are:

GENERAL: (Included with the game) The categories for this disk are history, the written word, movies & television, science & the world, and sports.

ENTERTAINMENT: These categories are movies, the stage, television, music, and literature.

BIBLE: 1100 questions in five categories on the Old and New Testaments.

SPORTS: This disk will challenge even the very knowledgeable sports fan. All major sports (and some minor ones) are represented.

CHILDREN: No, this isn't questions ABOUT children, it's questions FOR children. 1100 fun questions just for the younger set.

The game of **COLOR DISK TRIVIA** can be played by from 1 to 4 people (or teams), and you set the length of the game at the start when you decide how many questions must be answered in each category to win. The computer chooses the categories randomly, though sometimes it will let you choose the category for yourself (or let your opponents choose for you). Because of this category selection by the computer, a single category can often hold you up while one of your opponents slips by to win. The outcome is always in doubt, and no player is ever eliminated.

Trivia lovers will enjoy the fact that you can play without other people if you desire, because the computer will provide plenty of challenge. We want to emphasize that this is, first and foremost, a fun game.

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The Development System

Naturally, in order for our programmers to type in thousands of questions easily and accurately, a good development program to create the question disks had to be written, and we include this program with the game at no additional charge!

The program is all menu-driven and very user-friendly. That means that no knowledge of programming is needed to use it. If you can turn on your computer and type, you're all set! Now sit back and imagine the educational possibilities.

Yes, our question disks have 1100 questions, but the game program will handle question disks having any number of questions from 5 up to a full disk of 1100, so a teacher can type in 50 or 100 questions and answers (the questions are multiple choice), and then the students can play the "game" and have a great time, while accidently picking up the lesson. Let the natural spirit of competition fuel the learning process.

The development program is very easy to use, and gives you options to add questions, change or delete a question, and print the questions and answers on the screen (or a printer, if you have one). You can develop a question disk and easily add questions to it any time you wish.

This program finally gives parents and teachers the opportunity to easily create a custom learning program for any level student, and if we keep it a secret, no-one need know it's more than a game.

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EST  FIXEDPRICE BOND.  EACH BOND
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PER BOND.
9900 FOR I=1 TO 1600:NEXT:RETURN
```

Corrections

This note for non-disk users of the electronic spreadsheet program in "*MoCalc — MiniCalc* Gets a Big Brother" (April 1984, Page 186), author Barry Spencer says those who don't have Disk BASIC should replace the command *WRITE* with *PRINT* in Line 1020 and change *KILL* to *PRINT* in Line 1040.

H. Allen Curtis writes that we mistakenly indicated the minimum system for his *Bandy* program (June 1984 issue) to be Disk BASIC. This was done because of the use of *SAVE*, *LOAD*, and *WRITE* in the listing, but Curtis says, "The program logic is such that the lines containing those commands are bypassed when there is no disk controller connected." Thus, *Bandy* can be used in cassette-based 16K ECB — as indicated in the third paragraph of his article.

Curtis adds, however, that *LOAD*, *SAVE* and *WRITE* will not tokenize when used with a cassette-based system. Therefore, the last *Rainbow Check Plus* value for Listing 2 will be 187 for cassette users instead of the 101 value given in the "checkbox" on Page 144. The 101 value is correct for disk-based systems.

In the July 1984 first installment of our "Cooking With CoCo" series, Listing 1 (*BASLOAD*) was inadvertently left out. This omission led to Listings 2 and 3 being mislabeled 1 and 2. The missing Listing 1 is appended to the end of this month's "Cooking With CoCo" article and begins on Page 187.

Reader Steven Ostrom, Minnetonka, Minn., tells us that there is an error in the "Simply Load and . . . Bingo!" program (Page 92, April 1984 issue). The beginning of Line 520 should read *IF BB=>10* (*not, IF BB>10*). You need to add the "equal" symbol because, otherwise, when L=3 and BB=10, the middle row of the Bingo card will not have a free space.

Steven adds, "For my DMP-120, I had to add a printer delay (*POKE151,25*) in addition to changing the elongation commands that the author noted. This *POKE* is necessary for many programs that print, due to a bug in the DMP-120, even after the Radio Shack upgrade."

Damon Swanson writes, "There is an occasional but potentially deadly bug in my modification to Steve Good's Spooler, ("Make the Good Spooler Better," May 1984, Page 23). The disaster will strike if an interrupt occurs while in the RAM (Type 1) memory map.

"The bug rarely bites because the program is only at risk during 11 of the almost 15,000 clock cycles between interrupts, and it causes disaster only when the print buffer is empty, i.e., when printing the first character to the buffer. Under these conditions, the interrupt handler, START, detects the empty buffer and jumps to high memory expecting ROM but finding random code in RAM.

"If the buffer has at least one character, START gets that character from RAM and sets the map back to ROM before calling any ROM routines. We can still have an error — dropping one character. The program is at risk for seven clock cycles yielding an error rate of about one in 2,000 characters."

"Bugs of this species are hard to recognize, impossible to test, and often ignored. But a good programmer will find them and destroy them. Fortunately, this bug is easily exterminated."

Continues Swanson, "Add an ORCC #$50 (Line 743) to kill the potential interrupt before switching to the RAM page and ANDCC #$AF (Line 757) to turn it on again in the modified spooler listing. Also correct the start address to allow the four extra bytes (ORG $7F61 or $7CF0 with SCRPRT).

"Note there is no problem in the interrupt handler, START, which is synchronized with the interrupt and finishes long before another one comes along."

Thanks, Damon, your discussion calls attention to one of the more subtle problems of interrupt handling.

HARDWARE TUTORIAL

Get Your Feet Wet With These Paddles!

By Helene M. LaBonville

I am a tinkerer. So, when the Atari died, I just couldn't throw away a perfectly good set of paddles! Although I have no electronics background, I set out to convert the paddles to work on our system. It was easier than I had imagined. As a matter of fact, the hardest part of this project was obtaining the joystick plugs and 5-conductor cable.

I will illustrate two conversions. One is quite simple, the other is easy. I will not go into the theory of operation of the D/A converter nor of the *JOYSTK* command itself, as these topics have been well covered in prior articles.

Single Direction Model — Simple
Materials required for each paddle:
  1 5-pin (240) DIN plug
    5-inch length of hook-up wire (preferably black)

Atari Paddles are sold in pairs which are joined together by a mutual DB-9 plug. Remove the plug, unscrew the case, and refer to Figure 1 which is the current configuration of an Atari paddle. All that needs to be done to convert this paddle to CoCo (see Figure 2) is:

1) Add a jumper wire between one of the lugs of the momentary switch and lug 1 of the potentiometer. Disconnect the black terminal wire from the switch and solder the jumper wire directly onto the bullet connector. Reconnect. Next, solder the other end to lug 1 of the pot.
2) Install the DIN plug as per Figure 2. *Place the plug's cable sheath over the cable, now!* Strip one inch of outer insulation from the cable, then strip and tin about $^1/_{16}$" from each wire. Solder the connections as indicated and reassemble the plug.

(Helene M. LaBonville holds a B.S. degree in medical technology and has done post-graduate work in clinical chemistry. She has had her CoCo for three years and started HAC Labs, Ltd. after having difficulty obtaining parts needed to complete hardware projects.)

Switch Selectable Model — Easy

The addition of the switch and the fifth wire in this conversion allows each paddle to do double duty, i.e., you can select either horizontal or vertical directions with each unit.

Materials required for each paddle:

  1 5-pin (240) DIN plug
    6 foot 5-conductor cable (stranded)
  1 SPDT submini slide switch

1) Open the case, disconnect the terminals from the button switch and snip off the wires from the pot lugs. Remove the strain relief from the Atari cable and save the cable for future projects — I reuse everything!
2) Mount the slide switch to the top of the case. I drilled two holes side by side with a $^3/_{16}$" bit and enlarged them with a knife and file until the switch fit.
3) Carefully strip 4½" of outside insulation from the five conductor cable. Strip and tin about $^1/_{16}$" from each wire. Solder the connections as indicated in Figure 3. Note: In order to prevent damage (from overheating) to the button switch, I reused the bullet connectors from the Atari cable.
4) Install the DIN plug as per Figure 3. *Place the plug's cable sheath over the cable, now!* Strip one inch of outer insulation from the cable, then strip and tin about $^1/_{16}$" from each wire. Solder the connections as indicated and reassemble the plug.
5) Screw the cover(s) back on. Plug in the paddle(s) and test it/them with the following program:

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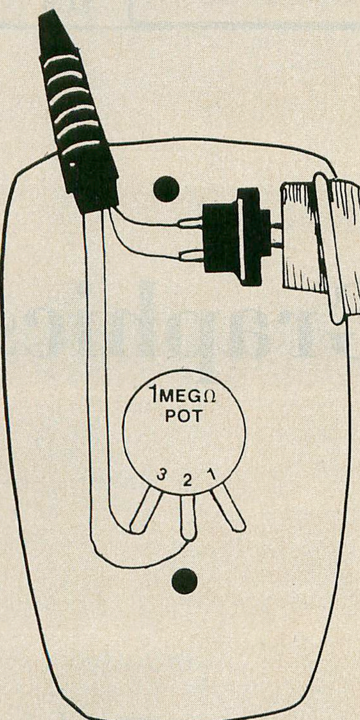

1MEGΩ
POT
3 2 1

Figure 1. Current Configuration of Atari Paddle

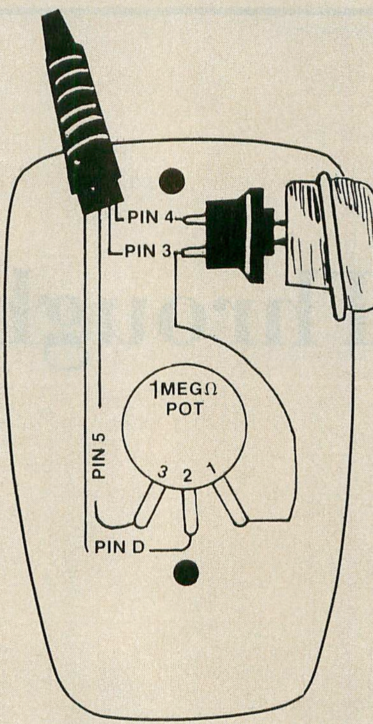

PIN 4
PIN 3
PIN 5
1MEGΩ
POT
3 2 1
PIN D

Figure 2. Single Direction Model D(irection) —Solder to Pin 1 for horizontal, or to Pin 2 for vertical

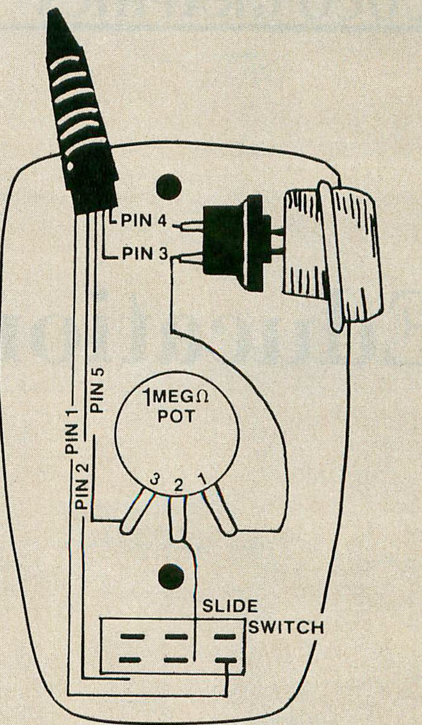

PIN 4
PIN 3
PIN 5
PIN 1
PIN 2
1MEGΩ
POT
3 2 1
SLIDE
SWITCH

Figure 3. Switch Selectable Model

```
10 PRINT JOYSTK(0);TAB(5) JOYSTK(1);TAB(10)
    JOYSTK(2);TAB(15) JOYSTK(3);TAB(20) PEEK
    (65280)
20 GOTO 10
```

JOYSTK(0) and *(1)*, of course, correspond to the right joystick port while (2) and (3) are the left one. *PEEKing* location 65280 checks to see if the fire buttons are pressed. If not "fired," this spot contains either the number 255 or 127. When the right button is pressed, this memory location contains either a 126 or 254. For the left button the *PEEK* should read either 125 or 253. Refer to the Radio Shack BASIC Manual for further elucidation. As you rotate the pot, the values should range from 0 to 63 for the channels which you are testing. The values for unused channels will hover between 20 and 40.

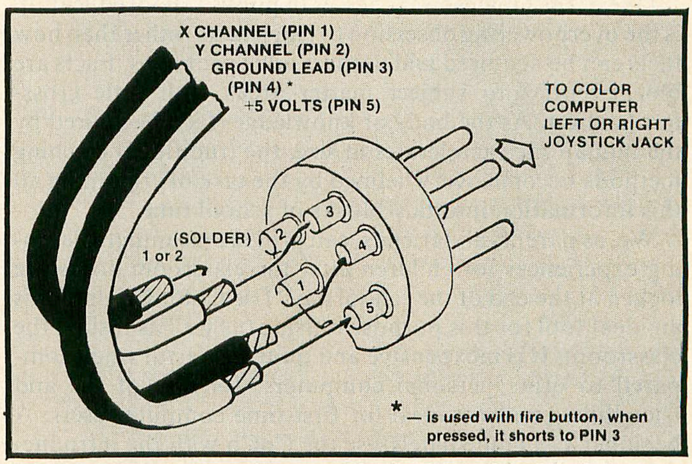
As a finishing touch, I marked off the midpoint (reading of 32) on each paddle with a dab of correction fluid.

Materials

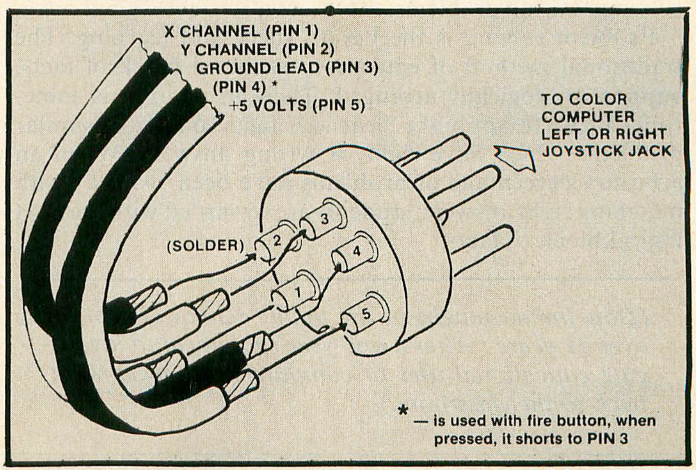
As I have mentioned, obtaining the parts proved to be the most difficult aspect of this project. For some unknown reason, Radio Shack does not carry the 240 5-pin DIN plugs, five conductor cable, or SPDT submini switches (one *is* enclosed, however, in (RS #275-327). Alternatively you could use one bank of a DPDT submini switch (RS #275-407) as in Figure 3.

I have bought a substantial supply of the plugs and cable. The Switchcraft plugs (12BL5M) can be purchased for $3 each, while the budget plugs (actually 6-pin DINs) are available for $1.75 each and the cable is available at 25¢/foot. USA orders please enclose an additional $1.50 to cover the cost of postage and handling. Others please add $3 S/H.

Atari paddles can be purchased for as little as $2.95/pair (JAMECO Electronics — Belmont, Calif.)


X CHANNEL (PIN 1)
Y CHANNEL (PIN 2)
GROUND LEAD (PIN 3)
(PIN 4) *
+5 VOLTS (PIN 5)
TO COLOR COMPUTER LEFT OR RIGHT JOYSTICK JACK
(SOLDER)
1 or 2
1
2
3
4
5
* — is used with fire button, when pressed, it shorts to PIN 3

Plug Connections — Single Direction Model


X CHANNEL (PIN 1)
Y CHANNEL (PIN 2)
GROUND LEAD (PIN 3)
(PIN 4) *
+5 VOLTS (PIN 5)
TO COLOR COMPUTER LEFT OR RIGHT JOYSTICK JACK
(SOLDER)
1
2
3
4
5
* — is used with fire button, when pressed, it shorts to PIN 3

Plug Connections — Switch Selectable Model

16K
ECB

Education Through Graphics

Don Inman
Rainbow Contributing Editor

Problems and Education

One of the greatest weaknesses of public school education is the overpowering obsession to teach facts rather than how facts can be acquired and used to solve problems. Facts are blocked off into subject matter areas with little cross-fertilization. As the body of knowledge (facts) acquired by the human race accelerates in size, the traditional teaching methods become overwhelmed by the task of cramming all this information into tidy blocks of school time.

We, as parents and friends, can provide meaningful learning experiences for children after the classroom doors are locked at the end of the school day. The Color Computer is an ideal tool for this purpose outside (as well as inside) the classroom. It is inexpensive and quite powerful when compared to other personal computers. Its ease of use and friendliness make it ideal for first-time computer users. A beginner can immediately use the CoCo with the introduction of a minimum of facts. Attention can then be turned to solving real-life problems.

Problem solving is the key to successful learning. The traditional method of education teaches a block of facts, supposedly logically arranged. Then an attempt is sometimes made to apply the "learned" facts to a set of similar problems which have right or wrong answers. When an arbitrary percentage of problems have been "solved" with matching right answers, students are rewarded with the next logical block of facts.

(Don Inman taught in the public school system for over 21 years. After a one-year sabbatical to investigate educational uses of computers, he never went back to the classroom.)

Problems faced in the real world do not have cut and dry "2+2=4" solutions. Real results are not black or white, right or wrong. There are many solutions to real problems, some better than others in a given situation.

Color LOGO provides one of the most free-form ways of learning that I have found. Anyone of any age can immediately encounter creative experiences with a minimum of factual knowledge with Color LOGO. The first LOGO commands encountered have a direct relationship to body-movements that are already familiar to a child.

> ***"We, as parents and friends, can provide meaningful learning experiences for children after the classroom doors are locked at the end of the school day. The Color Computer is an ideal tool . . ."***

Examples:
FORWARD, BACK, LEFT, RIGHT which can be abbreviated: FD , BK , LT , RT.

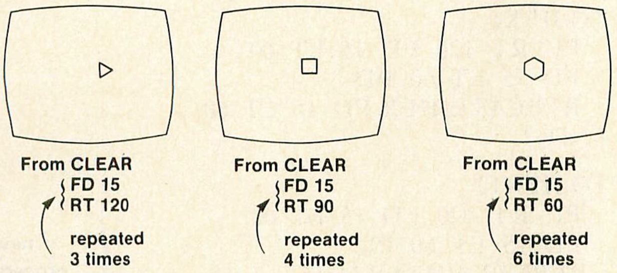
Shapes and turtle movements can be explored before the child is even aware of the concept of programs or procedures. In fact, the child will naturally develop a desire to write a complete LOGO procedure after experimenting with a few basic LOGO commands.

As you work with a child, listen closely for questions such as: "How can I . . . .?", "What if . . . .?" These are clues that the child is ready to move forth to new learning experiences. Be careful that you do not provide a solution to the problem raised. The child is merely seeking clues, or new tools, for solving the problem.

The Problem Develops

Let's suppose that a young child, named Sue, is experimenting with Color LOGO.

Figure 1:



Sue, "That looks like the shape the bees use when making a honeycomb. How can I make two of them alongside each other? Is there a short way to make a shape? Can the computer remember how I made the last shape?"

This sounds like the time to introduce procedures. A procedure is simply a way to have the computer remember the steps that Sue has previously used in drawing her hexagon.

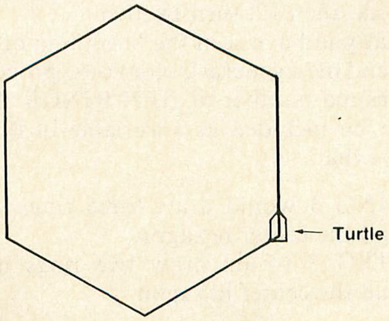
```
TO HEX      ← procedure's name
  FD 15
  RT 60
  FD 15
  RT 60
  FD 15
  RT 60
  FD 15
  RT 60
  FD 15
  RT 60
  FD 15
  RT 60
END
```

The procedure can be shortened by introducing the REPEAT command:

```
TO HEX
  REPEAT 6(FD 15 RT 60)
END
```

To make a second hexagon alongside the first, Sue could pick up the turtle's pen and move it to the right side of the first hexagon. Then the pen could be lowered in preparation for drawing another hexagon.

Figure 2:

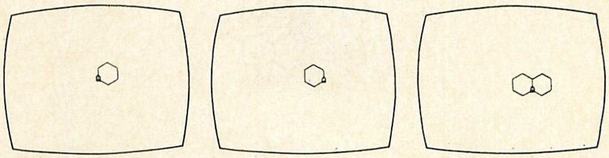


A second procedure is added to control the placement and drawing of the hexagons.

```
TO PAIR
  CLEAR                          ← clear the screen
  HEX                            ← use the HEX procedure
  PU RT 120 FD 15 LT 60
  FD 15 LT 60 PD
  HEX                            ← use HEX procedure again
END

TO HEX
  REPEAT 6(FD 15 RT 60)
END
```

Figure 3:



First Hexagon   Turtle Moved   Second Hexagon

Notice that the turtle ended at the point where the second hexagon was started. Now Sue asks, "Can I make a complete circle of shapes around the first one?"

Your answer, "Well it might be possible. Where would you have to move the turtle to start the next one?"

Sue, "I think I'd try moving it FORWARD 15 from the second shape and then turn LEFT 60. In fact, if I did that six times, I might get them all."

You, "Why don't you try it?"

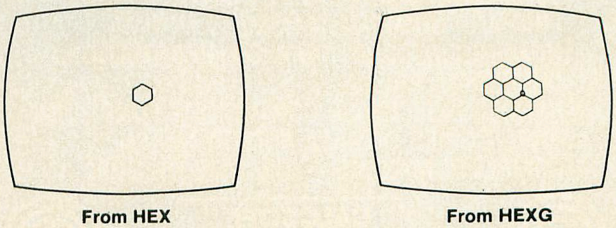
Sue, "Okay. I'll change the PAIR procedure and call it BEE. I'll call my new procedure HEX6."

```
TO BEE
  CLEAR
  HEX
  HEX6                          ← call to new procedure added
END

TO HEX
  REPEAT 6(FD 15 RT 60)
END

TO HEX6
  PU RT 120 FD 15 LT 60
  FD 15 LT 60 PD
  REPEAT 6(HEX FD 15 LT 60)
END
```

Figure 4:



From HEX   From HEXG

Sue, "It works! WOW! Now, I want to put another circle of shapes around that."

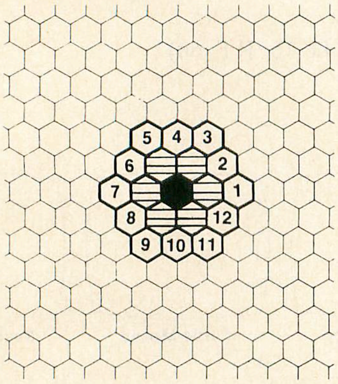
You, "How many little shapes do you think it will take?"

Sue, "*I* can try to fit them in my mind, or I can draw them on paper and count them."

You, "I have some paper here that has a grid made of the same shapes that you are working with. You can shade in the shapes you have so far, and then see how many you will need."

Sue drew them out like this:

Figure 5:



Sue discovered that she needed 12 new shapes to encircle the others. After a few false starts, Sue came up with the additional procedure HEX12. Of course she also needed to change the BEE procedure to call HEX12.

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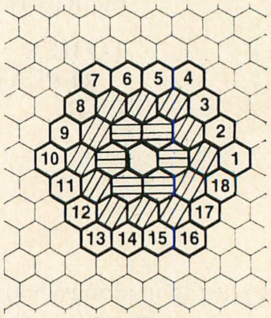
```
TO BEE
  CLEAR
  HEX
  HEX6
  HEX12                                     ← new line
END

TO HEX
  REPEAT 6(FD 15 RT 60)
END

TO HEX6
  PU RT 120 FD 15 LT 60
  FD 15 LT 60 PD
  REPEAT 6(HEX FD 15 LT 60)
END

TO HEX12
  PU RT 120 FD 15 LT 60                   |
  FD 15 LT 60 PD                          |       new
  REPEAT 6(HEX FD 15 LT 60                }    procedure
    HEX FD 15 RT 60 FD 15 LT 60)          |
END
```

Depending upon the child you are working with (age, ability, interest, or whatever), this development of HEX procedures may continue. By following the previous procedures with similar logic, can you write another HEX procedure to circle the outside 12 hexagons? How many small hexagons will be needed? If you draw it on a Hex-grid as we have, you will see that 18 new hexagons are needed.

Figure 6:



Study the figure, and see if you can come up with the necessary additions. If you want to go still farther, you will have to shorten the sides of the hexagons. How many hexagons would be needed in the next ring? Let's see . . . first one, then six, then 12, then 18, then . . . ?

Now that you have seen the beginning of drawing HEX RINGS, send me a general Color LOGO procedure for drawing any desired number of HEX RINGS. The number of rings is to be included as a variable in the name of the program so that:

HEXRING 3 would draw three rings of Hex shapes around the center hexagon.
HEXRING 5 would draw five rings of Hex shapes around the center hexagon.

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Interfacing Your Own Circuits

By T. Whit Athey and Susan C. Athey

In the first article of this series (July, Page 138), I described a general-purpose I/O interface for the Color Computer. The interface consists primarily of an 8255A Programmable Peripheral Interface (PPI) chip, installed on a modified Radio Shack printed circuit (PC) board which plugs into the cartridge slot. You can add your own circuits to the board where they can communicate with your CoCo.

In this article I will describe some examples of circuits which can be added to the interface board. By building the interface and connecting it to other devices, you can learn about the way the CoCo works and about digital circuits in general.

The 8255A has three eight-bit I/O ports, designated A, B, and C. In the main circuit I will describe, port A will be used as a data bus, and two lines of port C will be used as control lines, to communicate with and control a General Instruments AY-3-8910 Sound Generator Chip.

The AY-3-8910

The AY-3-8910 is a 40-pin LSI chip. It has 16 internal registers which control the frequency and amplitude of three independent tone generators, a noise generator, an envelope generator, and two 8-bit I/O ports. Almost any kind of sound can be produced under program control. The production of sound is dependent only on the contents of the internal registers, and these will change only when the register contents are overwritten. Continuous microprocessor attention is not required.

The 16 PSG registers are not directly addressable in the way that the four registers of the 8255A are. There is only the one 8-bit data bus over which data and addresses must be transmitted to the AY-3-8910, so the selection of the desired register must be done separately. You can think of the 16 registers of the PSG as being connected to its data bus through a multiport switch. Only one register at a time can be connected to the data bus (for reads or writes). This process of "connecting" a register to the bus is called "latching."

To latch a sound chip register to the data bus, two operations must be carried out. First, both control lines (from the

Table 1. PSG Pin Functions

Pin No.	Label	Function
1	GND	Ground
2	N.C.	(Not connected)
3	AUDIO-A	Audio channel A
4	AUDIO-B	Audio channel B
5	N.C.	(Not connected)
6	10B7	I/O port B, bit 7
7	10B6	I/O port B, bit 6
8	10B5	I/O port B, bit 5
9	10B4	I/O port B, bit 4
10	10B3	I/O port B, bit 3
11	10B2	I/O port B, bit 2
12	10B1	I/O port B, bit 1
13	10B0	I/O port B, bit 0
14	10A7	I/O port A, bit 7
15	10A6	I/O port A, bit 6
16	10A5	I/O port A, bit 5
17	10A4	I/O port A, bit 4
18	10A3	I/O port A, bit 3
19	10A2	I/O port A, bit 2
20	10A1	I/O port A, bit 1
21	10A0	I/O port A, bit 0
22	CLOCK	Clock reference signal
23	RESET	Logic zero resets registers to "0".
24	A9	Extra "address" or "chip select lines, logic 0 selects A9, logic 1 selects A8.
25	A8	These should be tied to GND and VCC if only one PSG chip is being used.
26	TEST2	A test point — not used here.
27	BDIR	Bus direction control line
28	BC2	Bus control line 2 — not used here
29	BC1	Bus control line 1
30	DA7	Data/address bit 7
31	DA6	Data/address bit 6
32	DA5	Data/address bit 5
33	DA4	Data/address bit 4
34	DA3	Data/address bit 3
35	DA2	Data/address bit 2
36	DA1	Data/address bit 1
37	DA0	Data/address bit 0
38	AUDIO-C	Audio channel C
39	TEST1	A test point — not used here
40	VCC	To +5 volts

(Whit Athey works for the federal government near Washington, D.C. Susan Athey is a 12-year-old student at Tilden Intermediate School in Rockville, Md. She wrote part of this article, and assembled nearly all of the hardware for this project and last month's I/O board, for a science fair project.)

Part II —

The Programmable Chip

8255A port C) must go high (to +5 V). This is a signal to the chip that the byte about to arrive over the data bus is the register number of the register to be latched. Second, the register number must be transmitted through port A, e.g., with a *POKE &HFF40,[*reg. no.*]*, over the data bus.

Once a register is latched it will remain latched until another register is latched. While it is latched, any write (or read) operation to the 8255A port A will also be a write to the sound chip register currently latched. The two control lines from port C must be set for a write (C0 = 1, C1 = 0) during the write operation.

For example, the following sequence of operations would be carried out to write the byte 3B (Hex) to register two (assuming that both A and C ports of the 8255A are already programmed for output).

First, latch register 2:

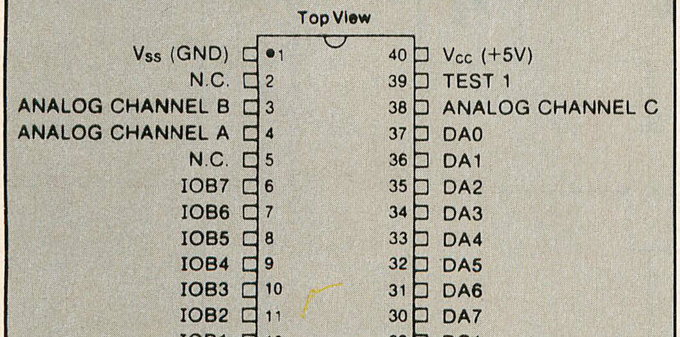
```
POKE &HFF42,3      (set C0 and C1 high)
POKE &HFF40,2      (send register no. to data bus)
POKE &HFF42,0      (reset control lines)
```

Then, write the byte 3B:

```
POKE &HFF40,&H3B   (put byte on data bus)
POKE &HFF42,1      (set control lines for write)
POKE &HFF42,0      (reset control lines)
```

These instructions illustrate the simple steps required to latch and write to a register, but unfortunately, they don't work in practice because of a timing problem resulting from the slowness of BASIC. The problem is that the sound chip wants to see the write indication on its control lines for no longer than 10 microseconds, while the BASIC *POKE* instruction requires about 4500 microseconds (that's still a lot less than a second!). The latch routine above will work okay, but the write routine will have to be done in machine language (using only three simple instructions). This can still be handled from BASIC using a *USR* subroutine (or *EXEC* statements for those of you without Extended BASIC). This will be discussed further in the software section.

Figure 1. AY-3-8910 Pin Assignments



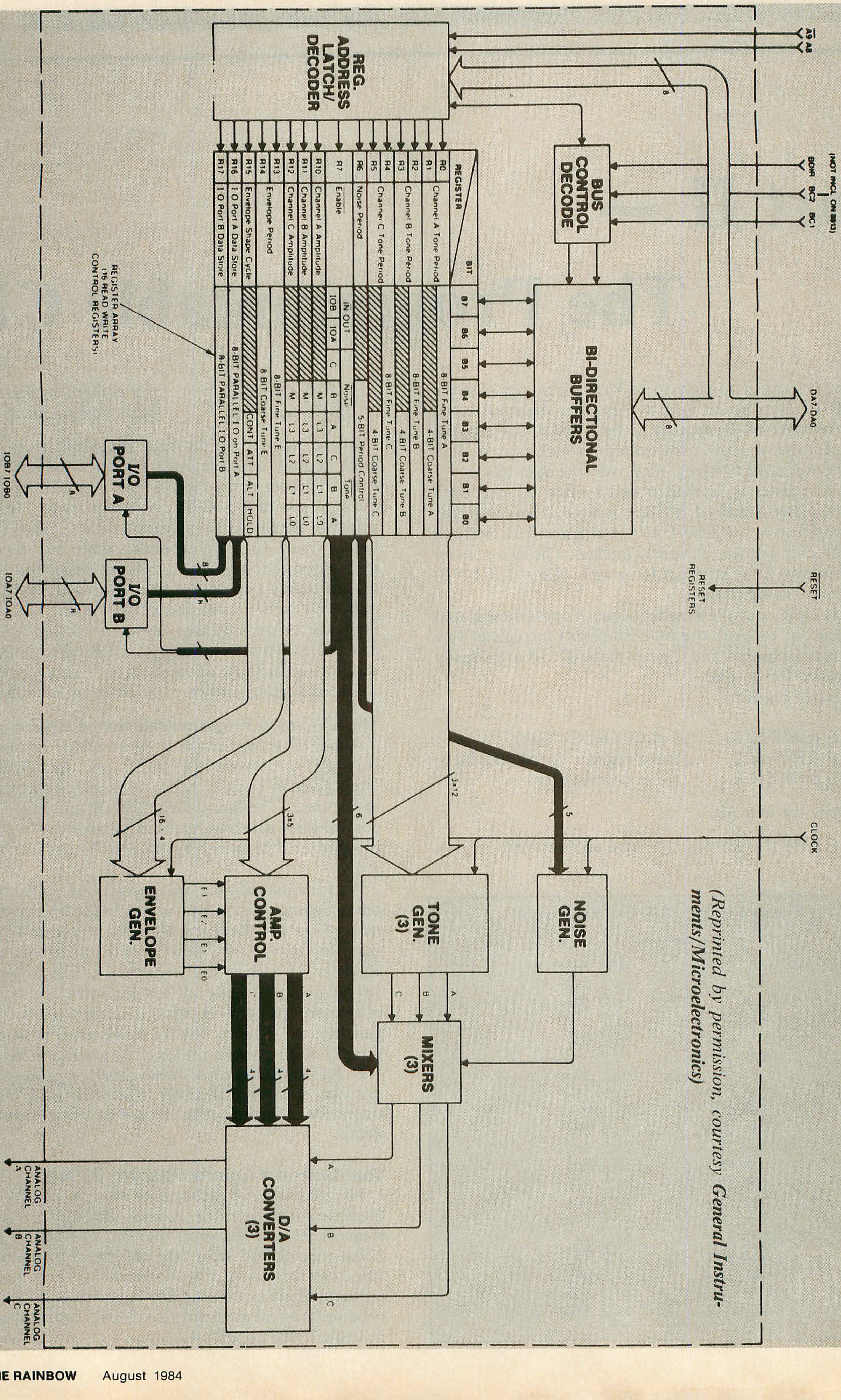
The AY-3-8910 Programmable Sound Generator Chip

A pin diagram for the programmable sound generator chip (PSG) is shown in Figure 1, and the function of each line is given in Table 1. A functional block diagram is shown in Figure 2. The lines labeled BDIR and BC1 are the two control lines which were discussed above. The functions of the chip are determined by these two lines as shown in Table 2.

All functions of the PSG chip are controlled by the computer through a series of writes to the 16 registers (designated R0-R15). Registers R0-R5 are used to select the frequencies (actually the periods) of the three-tone generators. Register R6 selects the frequency of the noise generator (white noise). Register R7 is for mixer control and I/O enable (for the two I/O ports). The amplitudes of the signals generated by the three tone channels are controlled by registers R8-R10 when in the level amplitude mode. Registers R11-R13 are for control of the envelope generator, and the last two registers, R14 and R15, are the two I/O ports. The operation of these 16 registers will now be discussed in more detail.

Tone Generator Control (Registers R0-R5)

The frequency of each square wave generated by each of the three tone generators is controlled by Registers R0-R5. Register R0 and the lower four bits of Register R1 form a 12-bit tone period value (the reciprocal of the frequency). The exact frequency of the tone which is produced depends on the reference clock signal. The period values needed to produce musical notes for two clock frequencies are shown in Table 3. The upper (most significant) four bits of Register



A9 A8
(NOT INCL. ON 8913)
BDIR BC2 BC1
DA7-DA0
RESET
RESET REGISTERS
CLOCK
REG. ADDRESS LATCH/ DECODER
BUS CONTROL DECODE
BI-DIRECTIONAL BUFFERS
REGISTER
BIT
B7 B6 B5 B4 B3 B2 B1 B0
R0 Channel A Tone Period
R1
R2 Channel B Tone Period
R3
R4 Channel C Tone Period
R5
R6 Noise Period
R7 Enable
R10 Channel A Amplitude
R11 Channel B Amplitude
R12 Channel C Amplitude
R13 Envelope Period
R14
R15 Envelope Shape/Cycle
R16 I/O Port A Data Store
R17 I/O Port B Data Store
8-BIT Fine Tune A
4-BIT Coarse Tune A
8-BIT Fine Tune B
4-BIT Coarse Tune B
8-BIT Fine Tune C
4-BIT Coarse Tune C
5-BIT Period Control
IN/OUT
Noise
Tone
IOB IOA C B A C B A
M L3 L2 L1 L0
8-BIT Fine Tune E
8 BIT Coarse Tune E
CONT ATT ALT HOLD
8-BIT PARALLEL I/O on Port A
8-BIT PARALLEL I/O Port B
REGISTER ARRAY (16 READ/WRITE CONTROL REGISTERS)
I/O PORT A
I/O PORT B
IOB7 IOB0
IOA7 IOA0
8
3x12
5
6
3x5
16 . 4
NOISE GEN.
TONE GEN. (3)
AMP. CONTROL
ENVELOPE GEN.
E3 E2 E1 E0
MIXERS (3)
A B C
4 4 4
D/A CONVERTERS (3)
ANALOG CHANNEL A
ANALOG CHANNEL B
ANALOG CHANNEL C

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Figure 2. Programmable Sound Generator Block Diagram

Table 3. Notes, frequencies, and codes

Note	Frequency (1.97 MHz clock) Hz	Frequency (.897 MHz clock) Hz	Hex Code	Note	Frequency (1.97 MHz clock) Hz	Frequency (.897 MHz clock) Hz	Hex Code
C	32.7	16.3	D5D	C	522.7	261.4	0D6
C#	34.6	17.3	C9C	C#	553.8	276.9	0CA
D	36.7	18.4	BE7	D	588.7	294.4	0BE
D#	38.9	19.4	B3C	D#	621.5	310.7	0B4
E	41.2	20.6	A9B	E	658.0	329.0	0AA
F	43.7	21.8	A02	F	699.1	349.6	0A0
F#	46.2	23.6	973	F#	740.8	370.4	097
G	49.0	24.5	8EB	G	782.2	391.1	08F
G#	51.9	25.9	86B	G#	828.6	414.3	087
A	55.0	27.5	7F2	A	880.8	440.4	07F
A#	58.3	29.1	780	A#	932.2	466.1	078
B	61.7	30.9	714	B	989.9	495.0	071
C	65.4	32.7	6AE	C	1045.4	522.7	06B
C#	69.3	34.6	64E	C#	1107.5	553.8	065
D	73.4	36.7	5F4	D	1177.5	588.7	05F
D#	77.8	38.9	59E	D#	1242.9	621.4	05A
E	82.4	41.2	54D	E	1316.0	658.0	055
F	87.3	43.7	501	F	1398.3	699.1	050
F#	92.5	46.3	4B9	F#	1471.9	735.9	04C
G	98.0	49.0	475	G	1575.5	787.8	047
G#	103.9	51.9	435	G#	1669.6	834.8	043
A	110.0	55.0	3F9	A	1747.8	873.9	040
A#	116.5	58.2	3C0	A#	1864.3	932.2	03C
B	123.5	61.7	38A	B	1962.5	981.2	039
C	130.8	65.4	357	C	2110.6	1055.3	035
C#	138.6	69.3	327	C#	2237.2	1118.6	032
D	146.8	73.4	2FA	D	2330.4	1165.2	030
D#	155.6	77.8	2CF	D#	2485.8	1242.9	02D
E	164.7	82.4	2A7	E	2663.4	1331.7	02A
F	174.5	87.3	281	F	2796.5	1398.3	028
F#	184.9	92.4	25D	F#	2943.7	1471.9	026
G	195.9	97.9	23B	G	3107.2	1553.6	024
G#	207.5	103.8	21B	G#	3290.0	1645.0	022
A	220.2	110.1	1FC	A	3495.6	1747.8	020
A#	233.0	116.5	1E0	A#	3728.7	1864.3	01E
B	246.9	123.5	1C5	B	3995.0	1997.5	01C
C	261.4	130.7	1AC	C	4143.0	2071.5	01B
C#	276.9	138.4	194	C#	4474.4	2237.2	019
D	293.6	146.8	17D	D	4660.9	2330.5	018
D#	310.7	155.4	168	D#	5084.6	2542.3	016
E	330.0	165.0	153	E#	5326.7	2663.3	015
F	349.6	174.8	140	F	5593.0	2796:5	014
F#	370.4	185.2	12E	F#	5887.4	2943.7	013
G	392.5	196.2	11D	G	6214.5	3107.2	012
G#	415.8	207.9	10D	G#	6580.0	3290.0	011
A	440.4	220.2	0FE	A	6991.3	3495.7	010
A#	466.1	233.0	0F0	A#	7457.4	3728.7	00F
B	495.0	247.5	0E2	B	7990.1	3995.0	00E

R1 are not used. The other two tone generators are controlled in exactly the same way with Registers R2-R5.

Noise Generator Control (Register R6)

The frequency of the noise source is controlled with Register R6. The lower five bits of this register form a five-bit period value. You can try stepping through the range of periods available (&H01 to &H1F) to select the period with the desired effect.

Mixer Control-I/O Enable (Register R7)

Register R7 is a multi-function enable/disable register which controls which of the tone or noise sources is connected to the mixers, and also defines the direction for the bidirectional I/O ports. The control bits and their functions are shown in Table 4.

Table 4. Mixer-I/O Control

Noise Enable Truth Table

R7 Bits			Noise Enabled on Channel		
B5	**B4**	**B3**			
0	0	0	C	B	A
0	0	1	C	B	-
0	1	0	C	-	A
0	1	1	C	-	-
1	0	0	-	B	A
1	0	1	-	B	-
1	1	0	-	-	A
1	1	1	-	-	-

Tone Enable Truth Table

R7 Bits			Tone Enabled on Channel		
B2	**B1**	**B0**			
0	0	0	C	B	A
0	0	1	C	B	-
0	1	0	C	-	A
0	1	1	C	-	-
1	0	0	-	B	A
1	0	1	-	B	-
1	1	0	-	-	A
1	1	1	-	-	-

I/O Port Truth Table

R7 Bits		I/O Port Status	
B7	**B6**	**IOB**	**IOA**
0	0	Input	Input
0	1	Input	Output
1	0	Output	Input
1	1	Output	Output

Amplitude Control (Registers R8-R10)

The amplitudes of the three tone channels are determined by the contents of the lower five bits of registers R10, R11, and R12. The upper three bits are not used. The fifth bit is used to select either fixed level or variable (envelope) amplitudes (0 = fixed, 1 = variable). The lower four bits contain the amplitude value when bit five is zero, and are ignored when bit five is one. There are 16 amplitude levels, 0000 -1111 (binary), which can be selected.

When bit five is one, the envelope control is enabled. A description of the envelope generator and its control follows.

Envelope Generator Control (Registers R11-13)

The shape of the envelope is determined by the contents of the lower four bits of register R13. The envelope shape is the time history of the amplitude (amplitude as a function of time). Figure 3 shows the different shapes which are available and the control values which select each shape.

Registers R11-R12 contain the time for one cycle of the envelope. These two registers are used as one 16-bit register, R12 containing the most significant bits and R11 containing the least significant bits. R12 can be considered the course tune value and R11 the fine tune value. The envelope periods available range from a value of 0001 (Hex) to FFFF (Hex), corresponding to .285 milliseconds to 18.7 seconds (assuming a .897 MHz clock).

I/O Ports (Registers R14-R15)

The PSG chip has two 8-bit I/O ports which can be used in a manner similar to the three I/O ports of the 8255A chip. When an 8-bit word is written to register R14, the data also appears on the eight PSG pins for port A. When the PSG ports are in the input mode, any data present on the pins will be present in the corresponding register (R14 or R15). A read of the register will retrieve the data to the computer for processing. The mode of the ports (input or output) is determined by the contents of the two highest bits of R7 as discussed earlier.

Adding The PSG To Your I/O Board

If you have finished your I/O board according to last month's article, the addition of the PSG will be fairly easy. You will need only the PSG chip and a 40-pin socket (see the previous article for socket sources). Unfortunately, General Instruments, the manufacturer of the PSG, and their distributors are not really very interested in the hobbyist business, and this makes the purchase of a PSG chip a little tricky. Arrow Electronics is a General Instruments distributor with many offices around the country, but they usually have a $50 minimum order. If you have a lot of other things to order anyway, then try Arrow. You might also find it at some Pioneer outlets. If you can't find a source, HIB Associates (3505 Hutch Place, Chevy Chase, MD 20815) has again agreed to fill mail orders (include $2 shipping and handling on all orders, five percent sales tax on Maryland orders). The PSG is priced at $9.50, and the 40-pin socket is $1.

Table 2. PSG Control Line Functions

BC1	BDIR	Function
0	0	Inactive
0	1	Write
1	0	Read
1	1	Latch

A suitable location for the PSG is directly across the board from the 8255 (use the same row numbers), on the last black rectangle. In this position, as was the case for the 8255, all of the pins will be accessible without removing the computer cover when the board is plugged in. Bend and solder the corner pins of the socket to the copper pads, and bend and solder two more pins near the center of the socket. Now follow the wiring list in Table 3. Make sure that all pins to be connected via the copper pads are bent and soldered to the pads. When you are finished, recheck your work against the wiring list until you are sure you have it right (improper connections may damage the chip or the computer). Now you can test the circuit using the test program shown in the next section.

In this design, the CoCo's clock signal (.897 MHz) on pin 6 of the cartridge connector is used as the clock signal for the PSG. Using a 1.79 MHz pulse would be better, allowing another octave of higher frequency tones. An external clock circuit may be used for this purpose if necessary. I will be glad to send you a simple clock circuit diagram if you include a self-addressed, stamped envelope with your request (6913 Breezewood Terrace, Rockville, MD 20852).

Table 5. Wiring List

Connect the copper strip running down underneath the new 40-pin socket to the ground bus. The two nearest strips parallel to the ground bus should be connected to Vcc (+5 V), forming a Vcc bus (one of these may already be connected to Vcc. Connect a 1000 ohm resistor between pin 38 of the AY-3-8910 and the ground bus. Connect a 0.1μF capacitor between Vcc and ground near pin 40 of the AY-3-8910 (or between its pin 40 and ground).

From	To	Signal
Vcc bus	AY-3-8910-25	Vcc
Vcc bus	-28	Vcc
Vcc bus	-40	Vcc
GND bus	-1	Ground
GND bus	-24	Ground
8255-14	-27	Port C, line 0 (control)
-15	-29	Port C, line 1 (control)
-4	-37	DO
-3	-36	D1
-2	-35	D2 (Data lines
-1	-34	D3 from
-40	-33	D4 Port A)
-39	-32	D5
-38	-31	D6
-37	-30	D7
AY-3-8910-3	-4	Audio
-3	-38	Audio
-3	CC Cartr.-35	Audio
CC Cartr.-6	AY-3-8910-22	Clock (.89 MHz)
-5	-23	Reset

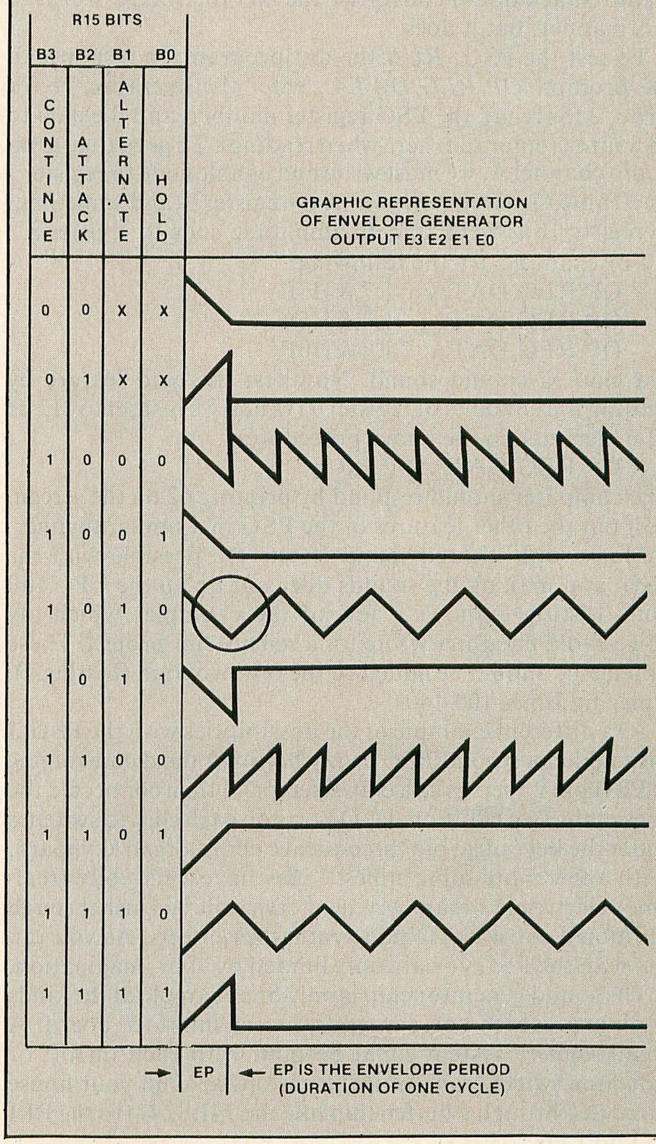
You may also want to connect AY-3-8910-3 (audio out) to an audio jack for playback through a separate sound system.

Software

The most important routines for controlling the PSG are the three which latch, write, and read. These must be written in machine language for proper timing and for maximum speed. Listing 1 shows these routines along with a short test program. It is assumed that the control lines are connected to PPI C-0 and C-1, and that the eight data lines are connected to port B.

The machine language instructions are shown in annotated assembly language in Listing 2. The statement numbers of the corresponding data statements are given in parentheses.

Figure 3. Envelope Shape/Cycle Control



This example of assembly language programming is so simple that no previous experience should be necessary to understand the way it works. Only four instructions are used, although one of them (STA) is used in two different addressing modes. In Listing 2 the operation code is in the left column and the number or address it operates on is in the right column. The dollar sign means that the number following is in Hex, and the "#" sign means that the number following should be treated as a number rather than as an address. *LDA #$80* means that the CPU A register should be loaded with the Hex number 80. *STA $FF43* means that the contents of the CPU A register should be transferred to address FF43 (which, in our case is the control register of the PPI). *LDA $FF40* means that the contents of address FF41 should be transferred to the A register. *CLRA* simply clears the CPU A register, and *RTS* returns control back to the program which is called the routine.

Listing 1 has a few statements which require Extended BASIC, but it may be modified to get around this problem. If you don't have Extended BASIC, simply make the following changes:

220 EXEC PA

260 EXEC PA+&H17
290 EXEC PA+&H2A
Delete Lines 8910, 8920, 8930

Radio Shack doesn't advertise the fact the *EXEC* works in this manner, but it does.

To test the PSG, *RUN* the test program. In response to the prompt, *OP,REG,DATA:,* enter the operation (1 for write, 2 for read), the PSG register number, and the data to be written (enter zero here when reading). To get a tone from audio channel A, we must write and enable code to register 7 (see Table 4), a frequency value to register 0 (and sometimes to register 1 as well), and an amplitude code to register 8.

For example, try the following:

```
OP,REG,DATA:  1,7,&H3E
OP,REG,DATA:  1,0,&HD6
OP,REG,DATA:  1,8,&H0F
```

The note C should sound. Now test the read feature by reading the contents of register 7 (which we just set to 3E, or 62 in decimal, in the above procedure):

```
OP,REG,DATA:  2,7,0
```

The computer should respond by printing 62 on the screen. Test out the other features of the PSG in a similar manner.

Many sophisticated sound effects are possible with the PSG, and making the sounds does not tie up the CPU full time. Listing 3 shows a few of the examples which my 12-year-old daughter wrote for a science fair project. These statements should be added to the test program (Listing 1), replacing Lines 100-140.

As a different example of the possibilities with the PSG, I have added a second PSG to my board (a third control line to PSG pin 25 serves as a chip selector). I then connected the lines of the two additional I/O ports on each chip to switches under the keys of an old three-octave chord organ keyboard. With a few more subroutines, I now have a six-voice (real-time) electronic organ. My next step will be (just through additional software) to add synthesizer effects. As you can see, with the PSG you are only limited by your imagination.

The sound generator chip is only one example of the kinds of circuits which you can add to your interface board. A great security system could be built with each on/off or indicator switch from critical locations around your house wired in (through a buffer chip like the 74LS241) to the PPI I/O port lines.

The important thing is to build *something*. It's the best way to start learning about the wonderful world of digital circuits.

Listing 1:

310 43
END 136

```
10 CLEAR1000,&H2FFF
20 PA=&H3000
30 'SELECT CARTRIDGE SOUND
40 AUDIOON
50 POKE&HFF01,&H34
60 POKE&HFF03,&H3C
70 GOSUB8900
90 '
100 'TEST PROGRAM
105 '
110 INPUT"OP,REG,,DATA:";OP,R,S
120 GOSUB210
130 IFOP=1THENGOSUB240ELSEGOSUB2
90
140 GOTO110
200 'LATCH
210 POKEPA+&H0B,R
220 X=USR1(0)
230 RETURN
240 'WRITE
250 POKEPA+&H18,S
260 X=USR2(0)
270 RETURN
280 'READ
290 X=USR3(0)
300 PRINT"CONTENTS=";PEEK(PA+&H2
9)
310 RETURN
8900 'READ AND STORE MACHINE LAN
GUAGE ROUTINES
8910 DEFUSR1=PA
8920 DEFUSR2=PA+&H17
8930 DEFUSR3=PA+&H2A
8940 'LOAD USR1, USR2, & USR3
8950 FORI=PA TOPA+&H41
8960 READY:POKEI,Y
8970 NEXTI
8980 RETURN
9000 'REGISTER LATCH ROUTINE
9010 DATA&H86,&H80
9020 DATA&HB7,&HFF,&H43
9030 DATA&H86,&H03
9040 DATA&HB7,&HFF,&H42
9050 DATA&H86,0
9060 DATA&HB7,&HFF,&H40
9070 DATA&H4F
9080 DATA&HB7,&HFF,&H42
9090 DATA&HB7,&HFF,&H40
9100 DATA&H39
9110 'WRITE DATA ROUTINE
9120 DATA&H86,0
9130 DATA&HB7,&HFF,&H40
9140 DATA&H86,&H01
9150 DATA&HB7,&HFF,&H42
9160 DATA&H4F
9170 DATA&HB7,&HFF,&H42
9180 DATA&HB7,&HFF,&H40
9190 DATA&H39
9195 DATA0
9200 'READ ROUTINE
9210 DATA&H86,&H82
9220 DATA&HB7,&HFF,&H43
9230 DATA&H86,&H02
9240 DATA&HB7,&HFF,&H42
9250 DATA&HB6,&HFF,&H40
9260 DATA&HB7,&H30,&H29
9270 DATA&H4F
9280 DATA&HB7,&HFF,&H42
9290 DATA&HB7,&HFF,&H40
9300 DATA&H39
```

Listing 2:

```
09000 *REGISTER LATCH ROUTINE
09010         LDA     #$80     SET PPI REG. FOR
09020         STA     $FF43      B/C PORT OUTPUT.
```

```
09030         LDA     #$03    SET BOTH CONTROL LINES
09040         STA     $FF42     (C PORT) HIGH.
09050         LDA     0       OPERAND GETS POKED REG. NO.
09060         STA     $FF41   WRITE REG. NO. TO PORT B.
09070         CLRA            ZERO A REGISTER.
09080         STA     $FF42   CLEAR CONTROL LINES.
09090         STA     $FF41   CLEAR DATA LINES.
09100         RTS             RETURN.
09110 *WRITE DATA ROUTINE
09120         LDA     0       OPERAND GETS POKED DATA.
09130         STA     $FF41   WRITE TO DATA LINES.
09140         LDA     #$01    SET CONTROL LINES FOR
09150         STA     $FF42     WRITE DATA.
09160         CLRA            ZERO A REGISTER.
09170         STA     $FF42   CLEAR CONTROL LINES.
09180         STA     $FF41   CLEAR DATA LINES.
09190         RTS             RETURN.
09200 *READ DATA ROUTINE
09210         LDA     #$82    SET PPI CONTROL REG. FOR
09220         STA     $FF43     B PORT INPUT.
09230         LDA     #$02    SET PSG CONTROL LINES
09240         STA     $FF42     FOR READ.
09250         LDA     $FF41   READ DATA ON DATA LINES.
09260         STA     (PA+$3F)        SAVE IN SPARE LOCATION.
09270         CLRA    CLEAR A REGISTER.
09280         STA     $FF42   CLEAR CONTROL LINES.
09290         STA     $FF41   CLEAR DATA LINES.
```

1590 202
1840 159
END 140

Listing 3:

```
100 PRINT"SOUND EFFECTS BY SUSAN
 ATHEY"
105 PRINT
110 PRINT"TYPE THE LETTER OF YOU
R CHOICE."
115 PRINT
120 PRINT"(A) SWEEP AMPLITUDE"
125 PRINT"(B) SWEEP TONE FREQUEN
CY"
130 PRINT"(C) GUN SHOTS + EXPLOS
ION"
135 PRINT"(D) EUROPEAN SIREN"
140 A$=INKEY$:IFA$=""THEN140
145 IFA$="A"THENGOSUB1510
150 IFA$="B"THENGOSUB1610
155 IFA$="C"THENGOSUB1710
160 IFA$="D"THENGOSUB1910
165 CLS:GOTO100
170 '
1500 'SWEEP AMPLITUDE
1501 '
1510 R=0:S=&HD6:GOSUB210:GOSUB25
0
1520 R=7:S=&O76:GOSUB210:GOSUB25
0
1530 FORA=0TO&H0F
1540 R=8:S=A:GOSUB210:GOSUB250
1550 NEXTA
1560 FORA=&H0FTO0STEP-1
1570 R=8:S=A:GOSUB210:GOSUB250
1580 NEXTA
1590 FORDLY=1TO200:NEXTDLY
1595 RETURN
1600 '
1601 'SWEEP FREQUENCY
1602 '
1610 R=7:S=&O76:GOSUB210:GOSUB25
0
1620 R=8:S=&H0F:GOSUB210:GOSUB25
0
1630 FORI=1TO3
1640 FORN=&HD6TO&H6BSTEP-1
1650 R=0:S=N:GOSUB210:GOSUB250
1660 NEXTN
1670 NEXTI
1680 RETURN
1700 '
1701 'GUNSHOTS AND EXPLOSION
1702 '
1710 V=16:G=15:F=0
1720 FORY=1TO5
1730 R=6:S=G:GOSUB210:GOSUB250
1740 R=7:S=7:GOSUB210:GOSUB250
1750 R=8:S=16:GOSUB210:GOSUB250
1760 R=9:S=16:GOSUB210:GOSUB250
1770 R=10:S=16:GOSUB210:GOSUB250
1780 R=12:S=V:GOSUB210:GOSUB250
1790 R=13:S=0:GOSUB210:GOSUB250
1800 FORDLY=1TO10:NEXTDLY
1810 NEXTY
1820 IFF=5THENRETURN
1830 FORDLY=1TO200:NEXTDLY
1840 V=56:F=5:G=0:GOTO1720
1900 '
1901 'SIREN
1902 '
1910 FORT=1TO10
1920 R=7:S=&O76:GOSUB210:GOSUB25
0
1930 R=8:S=&H0C:GOSUB210:GOSUB25
0
1940 R=9:S=&H0B:GOSUB210:GOSUB25
0
1950 R=0:S=&H6B:GOSUB210:GOSUB25
0
1960 R=2:S=&H69:GOSUB210:GOSUB25
0
1970 FORDLY=1TO100:NEXTDLY
1980 R=0:S=&H47:GOSUB210:GOSUB25
0
1990 R=2:S=&H46:GOSUB210:GOSUB25
0
2000 FORDLY=1TO100:NEXTDLY
2010 NEXTT
2020 RETURN
```

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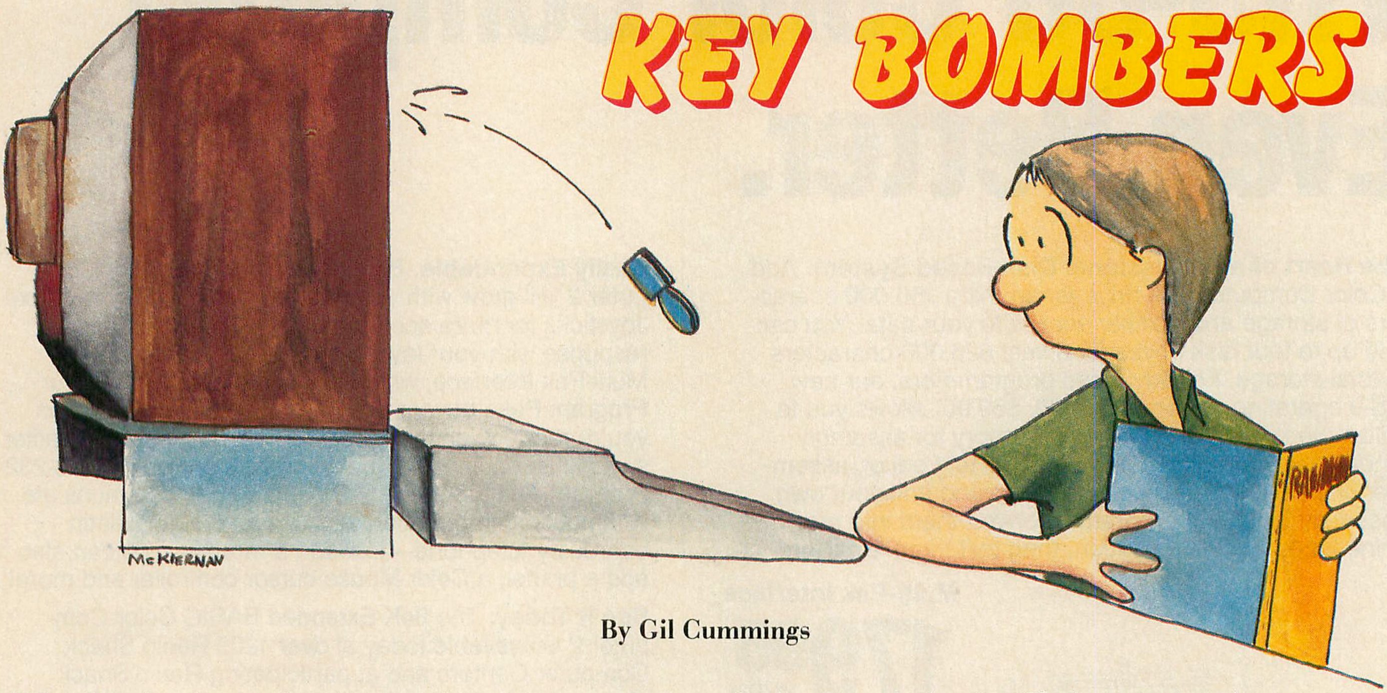

By Gil Cummings

My daughter took an instant shine to my computer. When it was new I couldn't power up without hearing a little voice pipe up, "Daddy, can I sit down and type *RUN*?" She had already seen the canned games that run on the Atari 2600 so she wasn't much impressed with my early efforts at programming. Every day she wanted to see something new and better. I found a winning formula pretty quick — use all the colors, lots of different sounds and plenty of visual and verbal rewards and go lightly on the "you lose" routines.

Even so, Julie's favorite game soon became, "Let's get Daddy away from the computer." I'd have something half baked in the RAM and when she tried to run it, it would throw an RG Error or some such put down. Then I'd tell her to wait until it runs a little better and instantly the face would cloud over with the "Oh, what a bummer!" look.

Or worse, the game would call for a lot of inputs, making the pace grind to a halt as she hunted for the keys. That kind of thing would end in something like "Oh, I can never win."

I've been at this for about two years now and in the process I've learned a little about computer programming and, more importantly, about fathering — a few things that I would never have known without access to a small computer. The Color Computer is the best kind of computer for this activity. Color and Extended Color BASIC make it easy to achieve the rewards of creativity, a real sense of satisfaction in seeing your dreams come true. Whatever you can dream you can bring into being through your CPU.

This little game helps kids make finding the right key a conditioned reflex. A small drama takes place above the keyboard as the bomber flits in and takes aim on a key. A bomb falls and it's up to the player to defend the helpless by pressing the targeted key, warding off the attack. The key colors and letters are stored in *DATA* statements, along with a symphony of inflight music. The graphics are all Lo-Res, the better to put all nine colors to work at once.

Line 2 provides room and board for an array in two dimensions, *LC$* (level, character). There are four rows of keys, 10 keys in each row. I put '@:' in the bottom row since they get a lot of action when programming. Lines 8 to 14 are subroutines for firing at the bomber, keeping score and making sure the bomber doesn't take aim on a key that's out of play.

The difficulty factor makes use of the tempo feature of the *PLAY* command. The lower the difficulty number, the slower the bomb whistles and the more time you have to respond with anti-aircraft fire. Lines 30-87 load in the colors and sounds, allowing the colors of the keys to change with each round of play. The bomber's inflight music corresponds to the key color.

Lines 100-165 draw the keys. Line 170 changes the row of keys presented with each round and awards bonus points for hitting five in a row. Line 190 paints the bomber (64 dazzling color combinations). Lines 200-290 control the play and build suspense as you wait for the bomb to drop. If the player presses the right key in time, it computes the score (more points for higher difficulty and quicker response). If the player misses, the key is out and a new round begins. A round is over when the player gets five in a row or loses the last key. A game is over after three rounds; then you get blue skies and a chance to do it again.

Instructions are in Lines 300-390, winning takes you to Lines 400-420 and losing all the keys gets you another chance at Line 500.

(Gil Cummings is an employee of Chevron U.S.A. in credit card customer assistance.)

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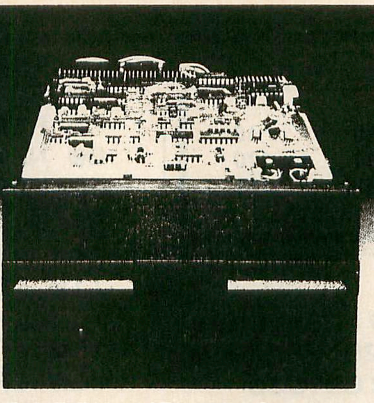

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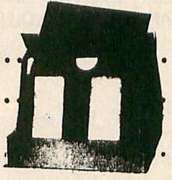

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150 48
304 170
END 187

The listing:

```
2 DIM CB$(8),LC$(4,10):WB$=CHR$(
128)+CHR$(128)+CHR$(128):KC=0:SC
=0:GC=1:SS=1:GOSUB300:GOTO30
8 FOR I=23TO 3 STEP -1:SET(H,I,C
):SET(H-1,I,C):PLAY"O5T64GGGE":R
ESET(H,I):RESET(H-1,I):NEXT I:PR
INT@KC*3-2,WB$;:SC=SC+DF*(31-V):
GOSUB10:RETURN
10 PRINT@487,USING"  SCORE #####
# #  ";SC,SS;:RETURN
12 CR=0:SS=1:C=0:LE=RND(4):FOR I
=1 TO 10:XC(I)=1:NEXTI:RETURN
14 FORI=1 TO 10:IF XC(I)=1 THEN
RETURN ELSE NEXTI:GOTO500
30 CLS0:INPUT" EASY - HARD (1 -
16)";DF:DL$=STR$(DF*4):CLS0:FORC
=1TO8:READ CC
40 CB$(C)=CHR$(CC)+CHR$(CC)+CHR$
(CC)
50 NEXT C
60 FOR I=1 TO 4:FOR J=1 TO 10
70 READ LC$(I,J)
80 NEXT J,I
85 FOR I=1 TO 8:READ FL$(I):NEXT
87 GOSUB12
100 J1=RND(7):J2=J1+10
110 FOR I=0 TO 2
115 L=385+I*32
120 FOR J=J1 TO J2
130 IF J<9 THEN C=J ELSE C=J2-J
140 PRINT@L,CB$(C);
150 L=L+3
160 NEXT J
165 NEXT I
170 IF SS>5 THEN PRINT @487,"!!!
!BONUS!!500!!!!";:FORI=1 TO 5:PL
AY"O"+STR$(I)+"T16CDEFGAB":NEXTI
:SC=SC+500:GOSUB10:GOSUB12:GC=GC
+1:IFGC>3THEN400
172 FOR LO=418 TO 445 STEP 3
175 CR=CR+1
180 PRINT @LO,LC$(LE,CR);:NEXT L
O:GOSUB10
190 BC=RND(8):WC=RND(8):BR$=CHR$
(115+WC*16)+CHR$(124+BC*16)+CHR$
(115+WC*16):IF SS>5 THEN100
200 KC=RND(10):IF XC(KC)=0 THEN
```

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```
200 ELSE DR=RND(4):PRINT@KC*3-2,
BR$;
205 H=KC*6-1:C=POINT(H,29):PLAYF
L$(C):IFDR=4THEN220ELSEPRINT@KC*
3-2,WB$;:GOTO200
220 H=KC*6-1
240 FOR V=3 TO 24:SET(H,V,C):SET
(H-1,V,C):PLAY"O4T"+DL$+"B-":RES
ET(H,V-1):RESET(H-1,V-1):IFINKEY
$=LC$(LE,KC)THENSS=SS+1:GOSUB8:G
OTO190ELSENEXTV
250 XC(KC)=0:PRINT@416+H/2,CHR$(
128);:PLAY"O1T2B-AGFE-DC":PRINT@
KC*3-2,WB$;:SS=1:GOSUB14:GOSUB10
290 GOTO 190
300 CLS:PRINT:PRINTTAB(42)"KEY B
OMBER"
302 PRINT:PRINT
304 PRINT"      LOOK OUT! UP IN T
HE SKY!       IT'S THE KEY BOMBER!
 HE'S         TRYING TO BOMB YOUR
COMPUTER      KEYS.  DON'T LET HIM
.  WHEN       HE DROPS HIS BOMB YO
U HAVE        TO PRESS THE KEY BEF
ORE THE       BOMB LANDS ON IT.  T
HEN YOUR      KEY IS SAFE!"
306 PRINTTAB(43)"GOOD LUCK!"
390 IFINKEY$=""THEN390 ELSE RETU
RN
400 CLS5:PRINT@(40),"THE SKIES A
BOVE";:PRINT@(103),"YOUR KEYBOAR
D ARE";:PRINT@(173),"SAFE!";
405 GOSUB 10
410 PRINT@266,"PLAY AGAIN?";
420 I$=INKEY$:IFI$=""THEN420ELSE
IFI$<>"N"THENRUNELSE PRINT@324,"
OK, TURN OFF THE COMPUTER.";:END
500 PRINT@262,"TH-TH-TH-THAT'S A
LL!";
510 PRINT@331,"TRY AGAIN?";
520 I$=INKEY$:IFI$=""THEN520 ELS
EIFI$="N"THENEND
540 RUN
899 IF INKEY$=""THEN 899 ELSE CL
S:LIST-888
900 DATA 143,159,175,191,207,223
,239,255
910 DATA 1,2,3,4,5,6,7,8,9,0
912 DATA Q,W,E,R,T,Y,U,I,O,P
914 DATA A,S,D,F,G,H,J,K,L,;
916 DATA Z,X,C,V,B,N,M,"@",":","
-"
920 DATA O2T8GAG,O2T16CDEFEDC,O2
T16EECCDGE,O3T8CDE,O3T8EDC,O3T16
EEECDDDB,O5T32CDEFGABAGFEDC,O5T8
BAG
```

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KRT SOFTWARE has announced that they are taking over CoCoData Enterprises' complete line of software. The line includes: *Graphics Program Generator II, Electricity Consumption Monitor, Household Budget Worksheet, LLIST-RITE, Match2, Screen Reference Program,* and the *Programmer's Worksheet.*

The programs are available at individual prices or the Super Bonus Pak of all programs for the single price of $49. For more information, contact KRT Software, P.O. Box 41395, St. Petersburg, FL 33743; phone (813) 321-2840.

* * *

"BULLETIN BOARD" BOB continues to tame the wild, wild West after extending his operation to California. Bob Rosen, president of Spectrum Projects, has now placed into operation the fifth of his popular Rainbow Connection bulletin board systems — and the first on the sunny Pacific Coast. The BBS operates from Spectrum Project's West Coast office in San Jose and can be accessed through the number (408) 984-7937.

The question now is: If it never rains in California — how can they have a Rainbow?

* * *

CO-PRODUCED BY COCO. Triad Pictures Corp. has announced a first for the Color Computer — what purports to be an "animation program that can turn a home computer into a Hollywood cartoon studio."

The Animator, to be available in late July, features professional motion picture animation techniques, 12 "help" screens and a comprehensive manual. The average non-programmer can create original animated cartoons of up to 1½ minutes (600 frames) with a frame rate roughly equal to a standard Bugs Bunny cartoon. Thirty-two "cels," or character positions, are cycled and recycled to create the illusion of motion. Sound effects can be included as well.

At $35 for the three-cassette package, *The Animator* sounds like it might be a real show stopper. It requires 32K and Extended Color BASIC and includes a library of cels, backgrounds and sound effects, as well as the "Animation Studio" itself.

If you would like to know more about *The Animator*, contact Triad Pictures Corp., 134 Simders Rd., Sequim, WA 98382; phone (206) 683-6459.

* * *

PRINTER THRONES from Royal Seating are featured in a new two-page brochure being distributed by the company. A full line of stands designed to accommodate any type printer is offered, incorporating various size slots and cutouts for front, center or rear feed and optional paper baskets for forms retrieval.

If you're interested in the brochure and a list of prices, contact: Royal Seating Corporation, Attn: Lorraine Moore, P.O. Box 753, Cameron, TX 76520; phone (817) 697-6421.

* * *

BAR CODE READING capability is being offered for the Color Computer by Peripheral Connections (PERCON) with a newly enhanced bar code reader that will connect to any computer that supports RS-232 ASCII communications. The E-Z-READER bar code reader features the Hewlett Packard digital wand and can read the three most popular industrial codes: Code 3 of 9, Interleaved 2 of 5, and Codabar/ABC.

The E-Z-READER is designed to read dot-matrix printed bar codes, as well as those printed conventionally. The pen design enables it to read through thin protective plastic and poorly printed bar codes. Also, it can detect the code over a range of angles and pen speeds as well as variable bar code densities. A "good read" audible signal is a standard feature.

The ability to read bar codes into your computer not only has several management and industrial applications, the potential exists for BASIC listings to be printed in bar code, such as those for the Radio Shack Model 100 being printed in PCM, THE RAINBOW's sister publication.

The E-Z-READER bar code reader is currently priced at $495. For more information, contact: Peripheral Connections, 2190 W. 11th St., Eugene, OR 97402; phone (503) 344-1189.

* * *

GOVERNMENT CONTROLS, those dreaded or praise-worthy restrictions (depending on your view), and consumer lawsuits are inevitably coming to the software marketplace, according to Bill Shoneman, vice president of XXCAL, Inc., a software testing firm. "The software industry is becoming big business and is developing a high profile both among consumers and the government," Shoneman says. "Sooner or later, they are going to start insisting on some assurances about the reliability of our products."

Shoneman finds the problem evident in the typical "non-warranty" disclaimer statement that appears on most software: *This program is provided as is without warranty of any kind — the entire risk as to the quality and the performance of the program is with you, the user.* "That kind of a statement," says Shoneman, "doesn't exactly inspire consumer confidence.

"Magazine reviews and newsletters can be very helpful," he continues, "but they shouldn't have to take the place of manufacturer testing, which the manufacturer should pay for as part of the product development cost. Unfortunately, too few companies are investing in testing — either their own or that of an outside firm."

XXCAL, of 1901 Avenue of the Stars, Los Angeles, CA 90067, provides such testing, ranging from a brief overview to an in-depth analysis and covering everything from technical content to documentation and ease of use. "Future successful software firms will be those that recognize the value of testing," says Shoneman. "They must realize that software success will only come to those who market programs that work."

Even if your views are a bit self-serving, Mr. Shoneman, we think they're very, *very* well put.

* * *

A LANGUAGE COMPILER that converts BASIC programs to machine code is being offered by LLOYD I/O for FLEX and OS-9 systems. *K-BASIC* has three general data types: Real, String and Integer. There are four integer sizes (8, 16, 32 and 64 bit) and Real numbers are 15 digit precision with an exponent of +/-99. There are directives, statements and functions not found in BASIC interpreters.

K-BASIC is available for all FLEX, OS-9 and Color Computer OS-9 systems for $199 from: LLOYD I/O, 19535 NE Glisan, Portland, OR 97230; phone (503) 666-1097.

* * *

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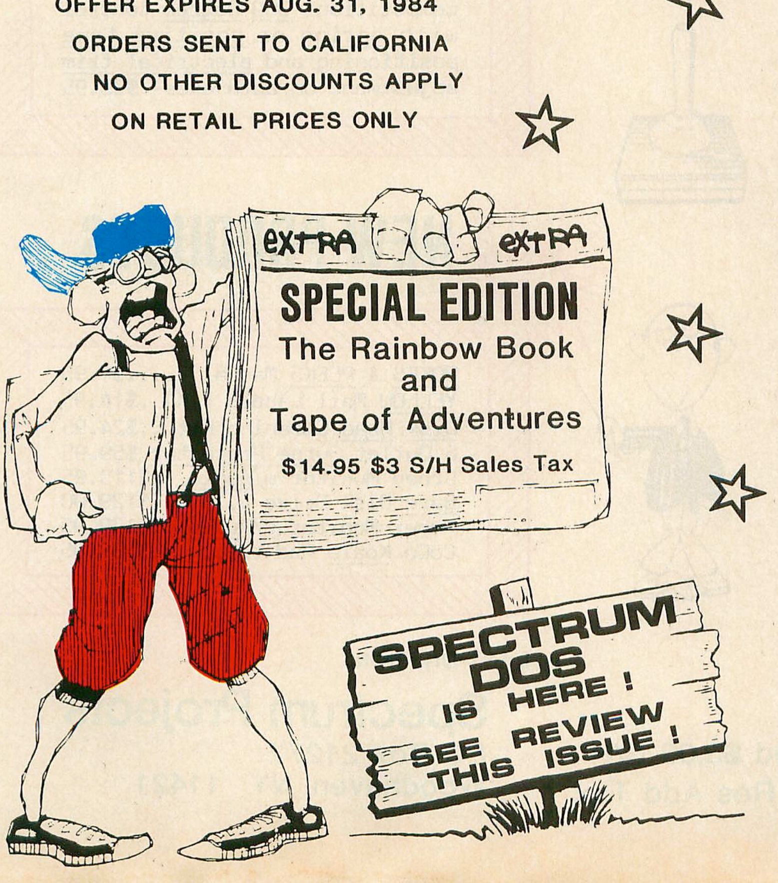

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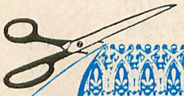

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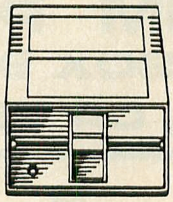

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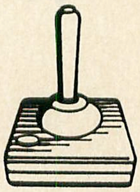

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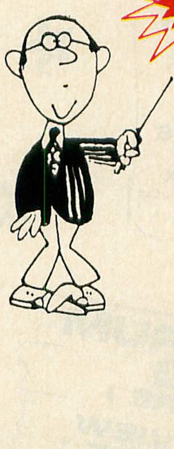

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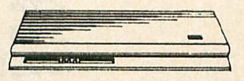

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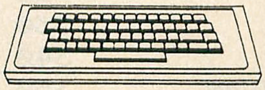

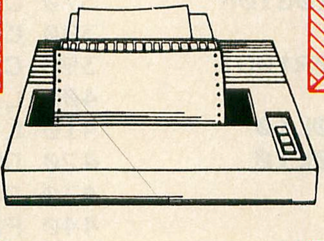

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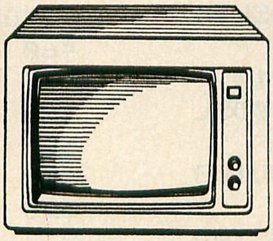

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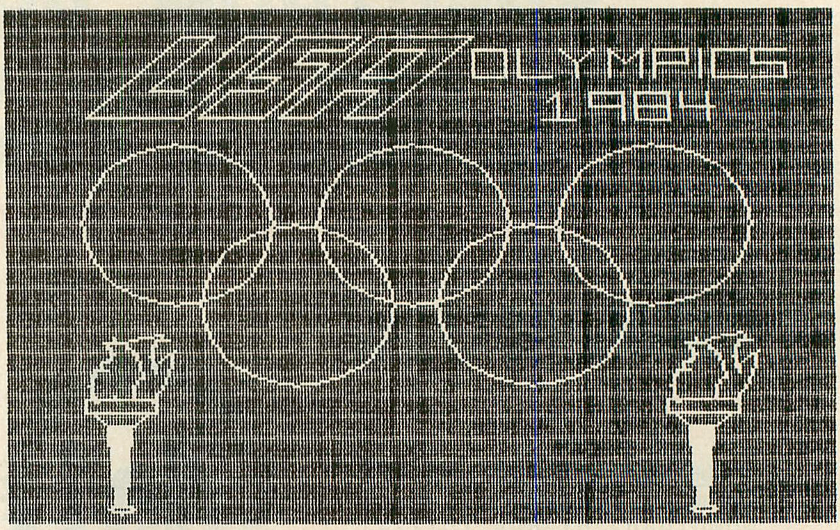

By Bill Duke

This is a 16K ECB graphics program that displays the five connecting rings universally known as the symbol of the Olympics. What better time to salute our athletes than in our games issue. Good luck, USA!

The listing:

```
10 PMODE4,1:PCLS:SCREEN1,1
20 GOSUB90
30 CIRCLE(126,80),30
40 CIRCLE(53,80),30
50 CIRCLE(200,80),30
60 CIRCLE(90,110),30
70 CIRCLE(163,110),30
80 GOTO80
90 DRAW"BM55,10;G30R30E30L10G20L
10E20L10
100 DRAW"BM90,10;G15R10G5L10G10R
20E20L10E5R10E5L20
110 DRAW"BM115,10;G30R10E10R10G1
0R10E30L30
120 DRAW"BM120,15;G10R10E10L10
130 DRAW"BM145,15;D10R10U10L10
140 DRAW"BM159,15;D10R10
150 DRAW"BM172,15;F5E5G5D5
160 DRAW"BM187,15;D10U10F5E5D10
170 DRAW"BM201,15;D10U10R10D5L10
180 DRAW"BM215,15;D10
190 DRAW"BM219,15;R10L10D10R10
200 DRAW"BM231,15;R10L10D5R10D5L
10
210 DRAW"BM171,31;D10R5L10R5U10G
3
220 DRAW"BM181,31;D5R10U5L10R10D
10
230 DRAW"BM195,31;D5R10D5L10U5R1
0U5L10
240 DRAW"BM209,31;D5R10L2U5D10
250 LINE(33,185)-(31,155),PSET
260 LINE(36,185)-(38,155),PSET
270 DRAW"BM32,155;R5
280 DRAW"BM33,185;R3
290 PAINT(33,175),5
300 DRAW"BM31,155;H5R18G5E5R2U5L
22D5R2
310 CIRCLE(29,140),4,,2,.30,.85
320 CIRCLE(29,128),4,,1,.85,.25
330 CIRCLE(33,142),10,,2,.70,.95
340 CIRCLE(43,145),5,,2,.47,.70
350 CIRCLE(22,127),30,1,1,.0,.12
360 DRAW"BM50,128;G4
370 CIRCLE(48,129),4,,2,.35,.85
380 CIRCLE(47,151),30,,1,.69,.75
390 CIRCLE(35,186),4,,.5
400 LINE(213,185)-(211,155),PSET
410 LINE(216,185)-(218,155),PSET
420 DRAW"BM212,155;R5
430 DRAW"BM213,185;R3
440 PAINT(213,175),1
450 DRAW"BM211,155;H5R18G5E5R2U5
L22D5R2
460 CIRCLE(209,140),4,,2,.30,.85
470 CIRCLE(209,128),4,,1,.85,.25
480 CIRCLE(213,142),10,,2,.70,.9
5
490 CIRCLE(223,145),5,,2,.47,.70
500 CIRCLE(202,127),30,1,1,.0,.1
2
510 DRAW"BM230,128;G4
520 CIRCLE(228,129),4,,2,.35,.85
530 CIRCLE(227,150),30,,1,.69,.7
5
540 CIRCLE(215,186),4,,.5
550 RETURN
```

(Bill Duke, a freshman in high school, has a 64K CoCo with one drive, printer and modem. He mainly works with graphics and his printer.)

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TAKING BASIC TRAINING 4K

Imagination And A Few Simple Graphics Techniques

Joseph Kolar
Rainbow Contributing Editor

One of the interesting features of the CoCo is the graphic character set. Refer to your manual for a review of *CHR$(128)* through *CHR$(255)*.

Using these graphic characters is fun. They allow any newcomer to CoColand to express him/herself artistically. Surprisingly, artistic ability is not a prerequisite to utilizing this capability of the CoCo. You might just as well learn how to use this effective enhancement of the CoCo and get your money's worth.

There are seven small listings that will help walk you through this tutorial.

Key in Lines 0, 10, 200, before you work on each program. At any time, you can *RUN* the program as you proceed to verify what you have added. Or, if you prefer, key in each program and follow along.

[20 PRINT@40, CHR$(128)]. A black box at screen location 40! Add another black box next to it. [+CHR$(128)]. To add two more black boxes, (squares), next to it, add [14A$=CHR$(128)]. Now, the black box has been assigned a name, A$. Add [+A$+A$] to Line 20. To add two more blocks, insert [15B$=A$+A$]. Two boxes, A$+A$ have been assigned a special name, B$. Add [+B$] to Line 20.

Note that you will be using concatenation, '+', exclusively in all of the programs. Think of concatenation as adding box cars to a freight train. You attach them to the end of the train using the plus sign.

Let's make a small design in the lower left-hand corner. Line [100PRINT@360,B$+B$] gives us four boxes that create a small horizontal bar. Note that you could have added [16C$=B$+B$] and changed line [100PRINT@360,C$]. Let's be simple as well as lazy. There are 32 columns to a screen line. We want to put a pair of boxes underneath and two spaces to the left. So, being lazy, we create line [101PRINT@360+32-2,].[360] is the starting location of our first row, [+32] positions us directly below the first box in the top row; [-2] moves over two spaces to the left. In effect, [PRINT@360+32-2,] is equivalent to [PRINT @360+30,] or [PRINT@390,].

For a beginner, it will be more meaningful to do calculations with small numbers to visualize what is happening as we move from one location to another. So, let's add [101PRINT@360+30,B$]

We wanted to skip four spaces and repeat the design element. Again, we consider: [360], the original location, [+32-2] or [+30], the beginning of the lower block; [+2], the spaces this block occupies; [+4], the four blank spaces we want to skip.

Line [102 PRINT@360+30+2+4,B$] adds the right-hand block in the desired location.

Remember, any time you want, just *RUN* your program to check it out and see if you follow the progress of the program.

We will close up the design by adding a block of four boxes, (squares), to the next row, directly under the top row. Since each row has 32 spaces, we want to add 64 spaces to our starting location, [360].

```
103 PRINT@360+64,B$+B$
```

Note that the first element, [B$], does not require a '+' because it is the locomotive of our imaginary freight train. However, you may insert it if you prefer. It won't do any harm. But, each succeeding element of the train must have the plus sign prefixed in front of the variable of the particular box car to be added to the train.

We have this blank space in our design. Blank spaces cry out to be filled. The first thing that comes to mind is that four empty spaces allow us to print a four letter word. The

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

second most obvious choice is, 'COCO'.

Referring to Line 102, we can pick up the location of the first letter, 'c'. [360] is the starting location; [+30], the starting location of the left element on the second line; [+2], the spaces taken up by the block. Now, we have reached the location of the first of the four blank spaces.

```
104 PRINT@360+30+2, "COCO";
```

Did you add [;] at the end of the line? Omit it and *RUN*. What alternative to [;] could you use to add the right-hand block?

You may rightly ask, "Why couldn't I have inserted 'COCO' into Line 102?" Creativity, being unpredictable, as it is, I didn't think of it until the design was finished. 'COCO' was an afterthought.

For practice, insert ['] in front of Line 104 to hold it but not to include it in the display and rewrite Line 102 to include 'COCO'. Then *DEL 104*. You have now tightened up your program to eliminate an unnecessary program line.

Line 102 should read:

```
102 PRINT@360+30+2, "COCO"+B$
```

For practice, change Line 14 to whatever solid color you prefer. A solid color will give you the most simple, but pleasing border. You might just as well DEL20 . Check your manual, or the training aid you made a few months ago if you followed this author's articles, to see how I got the blue graphic element. I used *CHR$(143+32)*. Could you have used *CHR$(175)* instead? This is Design Tutorial 2.

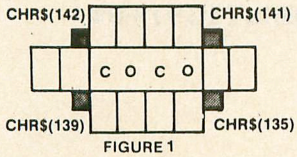

FIGURE 1

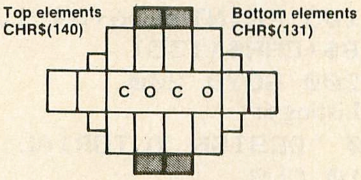

FIGURE 2

All well and good! You may as well move the design to the center of the screen.

For the purpose of this tutorial, we will relocate Line 100 first. You can figure out your desired location by referring to the *"PRINT@* Screen Location" chart in the manual.

However, creativity knows no rules. So, we will be real lazy and locate it by trial and error. Pick a location number that you think is in the middle. Say, 220. Change Line 100 to [PRINT@220] and *RUN*. Whoops! It's in the middle all right, but away off to the right. Move it over to the left, say, about 10, or [210]. Try it! N.G.! Well, move it over some more. Try [204] and *RUN*. Too much! How about [207]? Ah, that looks fairly well centered.

The design looks centered, but if you get a ruler and check the blank area on both sides, you will see that it is off center. Correct it by changing the location -1 or [206]. While you are at it, check with the ruler to see if it is neatly centered vertically.

Now, move the rest of the design by changing the [360] in Lines 101, 102, and 103 to [207]. Check it out! Why did it move over so nicely by changing all the locations to the same number?

The secret is that every line was based on the original starting location in this program. Do you see why the simple 'plus or minus' algorithm worked so effortlessly?

From what you have learned, can you change Line 102 to include the information in Line 101, effectively eliminating the need for Line 101?

Here is the solution. Compare Lines 101 and 102. Note that [B$] in Line 101 falls where [+2] is shown in Line 102. Put ['] in front of Line 101 to hold it for reference. *RUN* and note that you were right. Line 102 begins with 'COCO'. Adjust line 102 by changing [+2] to [B$+]. Did you remember to put in [+]? *RUN* it! If it is okay, [DEL 101]. This is Design Tutorial 3.

Finally, if you feel that this is the final location of your design, you may tighten up the tutorial. Change Line 102 to [PRINT@236,], instead of [PRINT@206+30,] and Line 103, to [PRINT@270,] instead of [PRINT@206+64,].

When we complete our design, we plan to move it to the top of the screen page. It will be a lot more difficult to move your design around the screen because you now have three distinct reference locations in your program rather than one. Also, if you add more elements to the design, (Who can resist improving a design?), you will have difficulty in locating the new elements. So, for this tutorial, let's not tighten it up.

Looking over the design, I wonder how it would look with small squares in the four corners? See Figure 1.

It would look better if the blue was changed back to black. Change Line 14 to [14 A$=CHR$(128)].

Since you know the system, do this on your own. Use 206 as your base location. Compare your results with Design Tutorial 4. It was no problem to concatenate the proper elements to the ends of Lines 100 and 103. Lines 101 and 104 were added because it was the simplest and laziest way to locate the two left-hand elements. If you fail to end these two lines with [;], you would wipe out the balance of the top and bottom rows. The final result should be Design Tutorial 4.

You can eliminate Lines 101 and 104 by changing Lines 100 and 103, just as you had done before to get Design Tutorial 3. This will give you Design Tutorial 5.

RUN it and then look over the listing carefully. The two arms in the middle row look too long. They could be altered so that they don't extend so far out. We may be creative but we are also lazy. Suppose we added a bit more black to the top and bottom rows? Wouldn't that make the design more symmetrical? See Figure 2.

We want to go one line above Line 100 and one space to the right to start our new elements. We calculate: [206] is the base location; [-32] locates us directly above Line 100 and [+1] moves us over one space.

```
99PRINT@206-32+1,CHR$(140)+CHR$(140)
```

To get the new bottom location, we pick up the location of the bottom row, Line 103. The location of Line 103 is [206], the starting location: [+64], two rows down; [-1], one space to the left. We add to these figures, [+32], one line below the base locaton of the line; [+2], two spaces to the right.

```
104 PRINT@206+64-1+32+2,CHR$(131)+CHR$(131)
```

This is Design Tutorial 6. *RUN*. That looks better! The four corners we added previously were too narrow. Can you change Line 100, using [CHR$(140)] and Line 102, using [CHR$(131)] on both ends to make it even more visually attractive? Just substitute!

We could continue to change and improve the design. For you persistent puzzle-solvers, try to change Lines 100 and 102 so that there is a little blank area above and below 'COCO' to give it a 'step' look. See what you come up with.

As a final exercise, to get Design Tutorial 7, we will move the entire design to the top of the screen, centered horizontally.

Use Line 99, the new top line of the design and relocate it. If you use the trial and error method, you may get an FC error. Keep at it! When you get it located to your satisfaction, change the [206] in Lines 100; 102; 103; 104; to your new value. *RUN*. If all looks fine, as a final test, simplify the locations in all the lines by appropriately adding or subtracting, to get a conventional, one-number location. For example, Line 99 would be changed from [PRINT@46+1-32,] to [PRINT@15,].

That blank area under your design is screaming for you to fill it in. I leave it to your imagination to work something up.

We got a lot of experience locating, inserting and moving elements of a design. We used a few simple techniques, by no means the only ones available, to fool around with graphic characters. If you read your final listing, you could suggest that, heck, we could have programmed Design Tutorial 7, in the first place. Sure — if we knew what we were going to create and where we were going to locate it on the screen.

Keep in mind that we started with a black square that we placed on the screen. We were creating. One thing suggested the next and who knew what the end result would be?

When you are bored, sit in front of the keyboard. Start with a graphic character and let your imagination run wild. No two people have the same creative thoughts. Your end result will surely be an original creation that may lead down some unexpected byway. Always pose problems and each time you solve them, you can go on dreaming up additional problems and then have fun solving them.

Listing 1:

```
0 'DESIGN TUTORIAL 1
10 CLS
14 A$=CHR$(128)
15 B$=A$+A$
20 PRINT @ 40, CHR$(128)+CHR$(12
8)+A$+A$+B$
100 PRINT@360, B$+B$
101 PRINT@360+30,B$
102 PRINT@360+30+2+4,B$
103 PRINT@360+64,B$+B$
104 PRINT@360+30+2,"COCO";
200 GOTO200
```

Listing 2:

```
0 'DESIGN TUTORIAL 2
10 CLS
14 A$=CHR$(143+32)
15 B$=A$+A$
100 PRINT@360, B$+B$
101 PRINT@360+30,B$
102 PRINT@360+30+2,"COCO"+B$
103 PRINT@360+64,B$+B$
200 GOTO 200
```

Listing 3:

```
0 'DESIGN TUTORIAL 3
10 CLS
14 A$=CHR$(143+32)
15 B$=A$+A$
100 PRINT@206,B$+B$
102 PRINT@206+30,B$+"COCO"+B$
103 PRINT@206+64,B$+B$
200 GOTO 200
```

Listing 4:

```
0 'DESIGN TUTORIAL 4
10 CLS
14 A$=CHR$(128)
15 B$=A$+A$
100 PRINT@206,B$+B$+CHR$(141)
101 PRINT@206-1,CHR$(142);
102 PRINT@206+30,B$+"COCO"+B$
103 PRINT@206+64,B$+B$+CHR$(135)
104 PRINT@206+64-1,CHR$(139);
200 GOTO 200
```

Listing 5:

```
0 'DESIGN TUTORIAL 5
10 CLS
14 A$=CHR$(128)
15 B$=A$+A$
100 PRINT@206-1,CHR$(142)+B$+B$+
CHR$(141)
102 PRINT@206+30,B$+"COCO"+B$
103 PRINT@206+64-1,CHR$(139)+B$+
B$+CHR$(135)
200 GOTO 200
```

Listing 6:

```
0 'DESIGN TUTORIAL 6
10 CLS
14 A$=CHR$(128)
15 B$=A$+A$
99 PRINT@206+1-32,CHR$(140)+CHR$
(140)
100 PRINT@206-1,CHR$(142)+B$+B$+
CHR$(141)
102 PRINT@206+30,B$+"COCO"+B$
103 PRINT@206+64-1,CHR$(139)+B$+
B$+CHR$(135)
104 PRINT@206+64-1+32+2,CHR$(131
)+CHR$(131)
200 GOTO 200
```

Listing 7:

```
0 'DESIGN TUTORIAL 7
10 CLS
14 A$=CHR$(128)
15 B$=A$+A$
99 PRINT@46+1-32,CHR$(140)+CHR$(
140)
100 PRINT@46-1,CHR$(140)+B$+B$+C
HR$(140)
102 PRINT@46+30,B$+"COCO"+B$
103 PRINT@46+64-1,CHR$(131)+B$+B
$+CHR$(131)
104 PRINT@46+64-1+32+2,CHR$(131)
+CHR$(131)
200 GOTO 200
```

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BLACKJACK ROYALE - A Hi-Res graphics casino blackjack simulation and card counting tutor. Fully realistic play includes: double down, splits, surrender, insurance bets, 1-8 decks, burnt cards, shuffle frequency and more! "This fine program is a must for the CoCo Blackjack player." (Aug '83 Rainbow Review) 32K TAPE/DISK **$24.95**

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Disk Drive Speed Check

By Roger Schrag

Have you ever suddenly been barraged by I/O Errors when trying to load a program from disk? Sometimes this is a sign that your disk drive needs some routine adjusting.

One of the things that can periodically slip out of line within your disk drive is its rotational speed. The disk drive is supposed to spin your diskettes at 300 revolutions per minute (rpm), give or take five percent.

Inside your disk drive there is a little knob which you may turn to adjust your disk drive's speed. This BASIC program will tell you how fast your drives are running. By repeatedly turning the knob slightly and then running the program, you may easily adjust your disk drives to perfect operating speed, thus saving a hefty repair bill.

If one of your drives is giving more than its fair share of I/O Errors, then run this program to see if indeed your drive's speed is off. The program will ask which drive you would like to check, and then will prompt you to insert an initialized diskette in the drive and press ENTER. Any diskette will do, as long as it has been initialized previously with the *DSKINI* command. The program then will draw up a chart of your drive's speed on 10 consecutive readings and the overall average.

If your drive is consistently more than about five rpm off from 300, you may wish to adjust the speed control. First, remove the outer cabinet by removing the four exterior screws. If your disk drive is a Radio Shack model, then the speed control is the bright yellow knob on the small circuit board on the same side of the drive as the large belt connecting the motor to the hub which grips the diskette.

Use a flat blade screw driver to turn the knob *slightly* in one direction or the other. Then run the speed check program again. Do this repeatedly until your drive's speed is within about five rpm of 300. Your drive does not need to operate at exactly 300 rpm, and fluctuations of one or two rpm is perfectly normal.

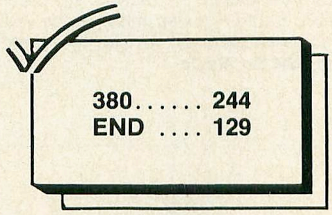
This little program lets you determine if the source of your disk problems is a drive motor running off speed. This program lets you also fix it if you are somewhat mechanically inclined. Please note that opening your drive may void your warranty. However, this should not be a problem; if your drive were still under warranty, you would take it back to the store if it exhibited any kind of problems whatsoever.

The program uses a short machine language subroutine to perform the actual timing. The data statements are set up so as to show the actual assembly language code that is being *POKEd* into memory.

All diskettes for the Color Computer have a pinhole in them called a "sector index hole." This pinhole passes in front of a sensor in the disk drive exactly once on each revolution. By reading this sensor, the machine language subroutine times how long it takes for the diskette to complete one revolution. From this information, the BASIC program is able to calculate how many revolutions the diskette would make in one minute if it continued spinning at that exact rate. This is the disk drive's rotational speed, measured in revolutions per minute.

(Roger Schrag, currently studying computer science at the University of California at Berkeley, enjoys working with the CoCo and writing articles for THE RAINBOW. *He also designs and translates programs for Adventure International.)*

If you have any questions or comments, please feel free to drop me a line. My address appears at the top of the program listing. Please include a self-addressed, stamped envelope, so that I may reply.



```
380...... 244
END .... 129
```

The listing:

```
1 REM ****************************
2 REM * DISK DRIVE SPEED CHECK *
3 REM ****************************
4 REM
5 REM  BY: ROGER SCHRAG
6 REM      2054 MANNING AVENUE
7 REM      LOS ANGELES, CA 90025
8 REM
9 REM
100 CLS:CLEAR 500
110 READ B$:IF B$="END" THEN 130
120 A$=A$+B$:READ DUMMY$:GOTO110
130 FOR X= 1 TO LEN(A$)/2
140 Y=VAL("&H"+MID$(A$,X*2-1,2))
150 POKE X+3585,Y:C=C+Y:NEXT X
160 IF C<>4001 THEN 490
170 S$=STRING$(32,61)
180 F1$="TRIAL ##  SPEED ###.##"
190 F2$="AVERAGE          ###.##"
200 PRINT "DRIVE SPEED CHECK"
210 PRINT S$
220 PRINT@128,"WHICH DRIVE";
230 INPUT DV:PRINT@142," "
240 IF DV<0 OR DV>3 THEN 220
250 PRINT:PRINT"PLEASE MOUNT ";
260 PRINT"AN INITIALIZED"
270 PRINT"DISK IN DRIVE";DV;
280 INPUT"& PRESS ENTER";X
290 CLS:PRINT"SPEED CHECK -- ";
300 PRINT"DRIVE";DV:PRINT S$;
310 DSKI$ DV,17,1,A$,B$
320 POKE &HFF48,3
330 TL=0: FOR TR=1 TO 10
340 POKE 2437,120 :EXEC 3586
350 SP=PEEK(3584)*256+PEEK(3585)
360 IF SP=0 THEN 450
370 SP = SP * 0.026779174
380 PRINT USING F1$; TR,SP
390 TL=TL+SP: NEXT TR
400 AV=TL/10
410 PRINT TAB(9)"--------------"
420 PRINT USING F2$; AV
430 PRINT@498,"PRESS ENTER";
440 INPUT X:CLS:GOTO 170
450 PRINT@384,"**** ERROR ****"
460 PRINT"PLEASE CHECK DISK ";
470 PRINT"IN DRIVE";DV
480 GOTO 430
490 PRINT"DATA ITEM INCORRECT"
500 STOP
510 REM
520 REM MACHINE LANGUAGE ROUTINE
530 REM
540 DATA"3413"   ,"ST PSHS A,X,CC
550 DATA"1A50"   ,"   ORCC #$50
560 DATA"9E8A"   ,"   LDX  $8A
570 DATA"8602"   ,"   LDA  #$02
580 DATA"3001"   ,"L1 LEAX 1,X
590 DATA"2719"   ,"   BEQ  EX
600 DATA"B5FF48","   BITA $FF48
610 DATA"27F7"   ,"   BEQ  L1
620 DATA"9E8A"   ,"   LDX  $8A
630 DATA"3001"   ,"L2 LEAX 1,X
640 DATA"2710"   ,"   BEQ  EX
650 DATA"B5FF48","   BITA $FF48
660 DATA"26F7"   ,"   BNE  L2
670 DATA"3001"   ,"L3 LEAX 1,X
680 DATA"2705"   ,"   BEQ  EX
690 DATA"B5FF48","   BITA $FF48
700 DATA"27F7"   ,"   BEQ  L3
710 DATA"BF0E00","EX STX  $E00
720 DATA"3593"   ,"   PULS CC,X,A
,PC
730 DATA"END","MARK END OF DATA
```

TRS-80+ MOD I, III, COCO, TI99/4a
TIMEX 1000, OSBORNE, others

GOLD PLUG - 80

Eliminate disk reboots and data loss due to oxidized contacts at the card edge connectors.
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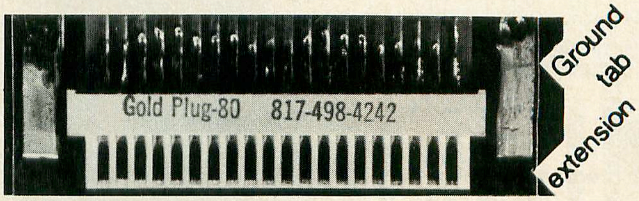

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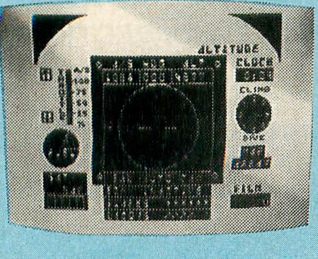
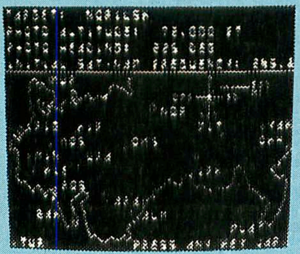
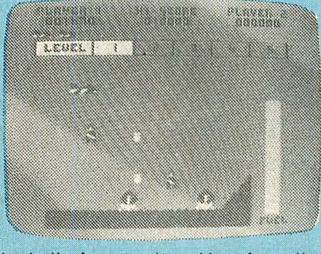




SR-71

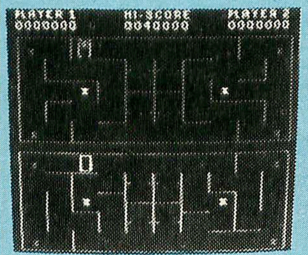
SR-71 is a fast action game in which you are the pilot on a mission to take photographs of missile sites in Russia and deliver them to our processing laboratory in Japan. So real you will feel as if you are in the cockpit on a real spy mission. Elude Russian missiles as well as their detection devices. Another Tom Mix exclusive. A must for the adventurous. Fantastic graphics, color and sound. **32K Ext. Basic** **TAPE $28.95** **DISK $31.95**

SKRAMBLE



Your mission is to penetrate the enemy skramble system and destroy their headquarters. You will start with three of our latest spacefighters equipped with repeating cannon and twin bomb launcher. If you succeed in evading the elaborate ground defenses, you will arrive at the Cave where flying becomes more difficult. In the cave are UFOs, after which you must avoid a hail of meteorites. Very few pilots succeed this far, but if you do, then you must enter the Fortress, followed by the Maze. One or two player game. Machine Language, high speed, Arcade action. Full color graphics with sound. Keyboard or joystick control.

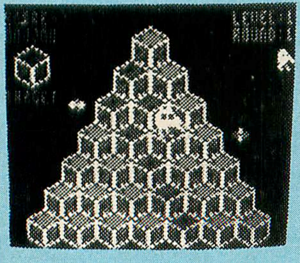
16K MACHINE LANGUAGE **TAPE $24.95** **DISK $27.95**



GRABBER

A pac type game. Two complete mazes jump from one to the other. Probably the most outstanding sound you have ever heard. Arcade Action. Method of play, you are the Grabber. The object is to grab the 8 treasures and store them in the center boxes. You start with 3 Grabbers and get extra ones at 20,000 points. Watch out for the googlies! Super high resolution graphics.

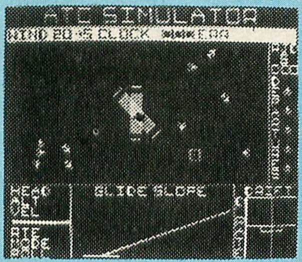
32K MACHINE LANGUAGE
TAPE $27.95 **DISK $30.95**



CU✱BER

Approaches the excitement and challenges of any Video Arcade. The hazards of CU✱BER are many. Help CU✱BER change the colors on the pyramid while avoiding many of the dangers always present. Vipers, the Nurd, the Dork, bonus points all add up to another exciting release from Tom Mix Software.

32K MACHINE LANGUAGE
TAPE $27.95 **DISK $30.95**



AIR TRAFFIC CONTROLLER

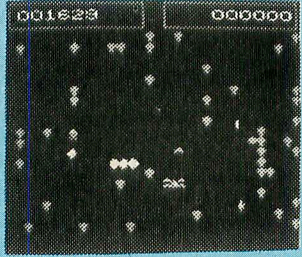
Air Traffic Controller is a computer model of an air traffic control situation for the TRS-80 Color Computer. Remotely Piloted Vehicles (RPV's) are operated by the controller in a situation similar to that of a commercial airline in that you must regulate landings and takeoffs of the vehicles.

32K EXT. BASIC
TAPE $28.95 **DISK $31.95**

KATERPILLAR II

The color computer has needed a perfect centipede type game since day one. You will throw all imitations aside when you see this. So close to the arcade you will start digging for quarters. Grapic to equal "The King" and "Buzzard Bait." Joysticks required.

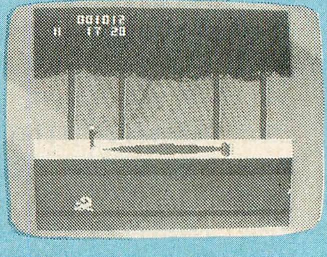
16K MACHINE LANGUAGE
TAPE $24.95 **DISK $27.95**

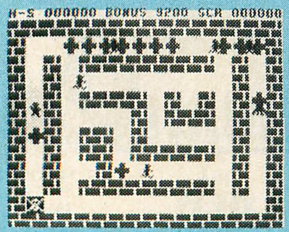


TRAPFALL

The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."

16K MACHINE LANGUAGE
TAPE $27.95 **DISK $30.95**





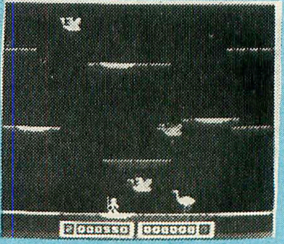
FANGMAN

Fangman is a high-resolution graphics arcade-type game based on the Dracula legend. Plot of Game: You're Dracula in your castle, stalking through a labrynth of passages in search of invading villagers seeking to destroy you by blocking your every path with deadly crosses. Their ally the Sun also wanders your halls, trying to touch you and turn you to bones and dust. Fortunately, you have allies of your own, the vampire bats who cahse down the villagers, holding them till you arive. Joysticks required. **16K MACHINE LANGUAGE**
TAPE $24.95 **DISK $27.95**

BUZZARD BAIT

We've done it again. You thought The King was great? Wait til you see this!! Outstanding high resolution graphics, tremendous sound make this "joust" type game a must for your software collection. As you fly from cloud to cloud you will enjoy sky high excitement dealing with the challenges presented to you by this newest release by Tom Mix Software. Joysticks required.

32K MACHINE LANGUAGE
TAPE $27.95 **DISK $30.95**



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SCREEN PRINT ROUTINE Prints contents of your graphic screen to an Epson, Microline or Radio Shack DMP Printers. Prints positive or reverse format. Horizontal or vertical, small and large printout. Print left, right or center of page. Specify printer when ordering. **TAPE $19.95** **DISK $21.95**

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TAPE $17.95 **DISK $21.95**

COLOR MONITOR Written in position independent code. (May be located in any free memory). Very compact. Only occupies 1174 bytes of memory. Full featured, includes Break-Pointing of machine language programs, register display and modify, memory display and modify, and block memory move commands. Displays memory in hex and ascii format on one line 8 bytes long. **Machine Language**
TAPE $24.95 **DISK $27.95**

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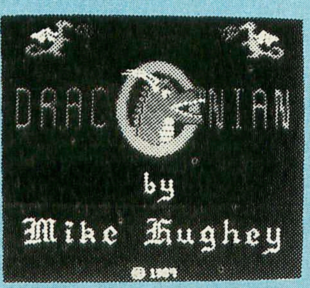


DRACONIAN

You brace yourself as your ship materializes in the enemy sector. Your engine roars to life, and you consult the long-range scanner for the position of the nearest enemy base. As you head for the base, blasting asteroids and space-mines in your path, you suddenly notice a monstrous space-dragon looming before you. Reacting quickly, you dodge his deadly fire-breath and blast him out of existence.

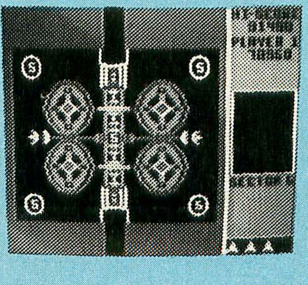
Finally, the enemy base comes into view. Avoiding the enemy fire, you destroy the gun turrets one by one with your rapid-fire torpedoes. Then, with the explosions still echoing around you, you rescue the astronaut who was being held prisoner by the enemy. Your mission is far from over, however, as there are more bases to destroy and more astronauts to rescue before the sector will be secured. And all must be done quickly; if you are too slow, the invincible DRACONIAN will surely seek you out as its next victim.

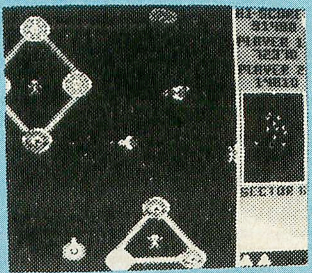
This is it — the single most impressive, awe-inspiring arcade game you can buy for your Color Computer. High-resolution graphics, awesome sound effects, four-voice music, and quality you have to see to believe! Experience the realism of DRACONIAN today!

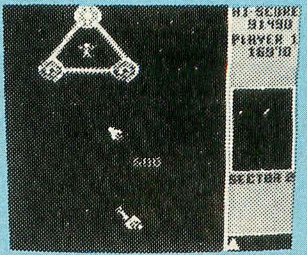
JOYSTICKS REQUIRED

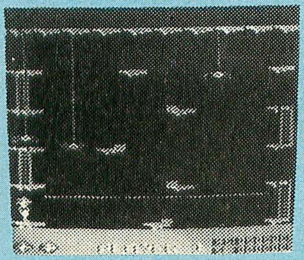
32K MACHINE LANGUAGE

TAPE $27.95 **DISK $30.95**









CRASH

This game is a high resolution Machine Language program with outstanding Arcade type graphics. The game consists of 4 screens. Fly the airplane over and through obstacles. Piloted by "Mario" who also appeard in "The King". The object is to conquer one screen after another but don't "Crash". Great fun for the whole family. For 1 or 2 players. Uses joysticks.

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**

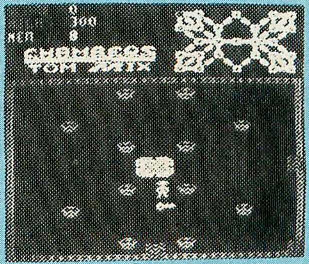
CHAMBERS

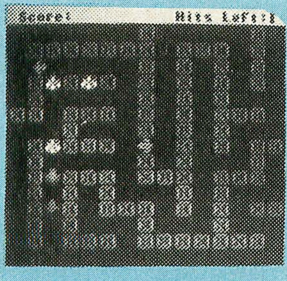
Exciting high resolution graphics game. Multiple screens. Outstanding sound, Chambers is loosely based on Cosmic Chasm. The object in each level is to destroy all of the evil creatures in each room and then go into the main reactor room and blow up the base.

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**





WAREHOUSE MUTANTS

Journey through the warehouse seeking out the Mutants who are out to destroy you. WATCH OUT! They will push crates trying to crush you! Outstanding realism—high resolution graphics—multiple screens.

JOYSTICKS REQUIRED

16K MACH. LANGUAGE

TAPE $24.95

DISK $27.95

QUIX

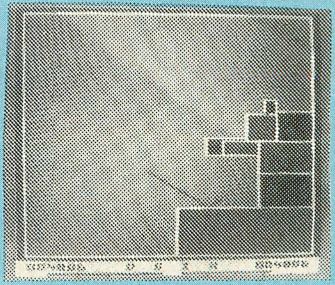
This one is after a popular arcade game with a similar name. Simply frustrating—you'll love it. Done in high resolution graphics with Super Sound.

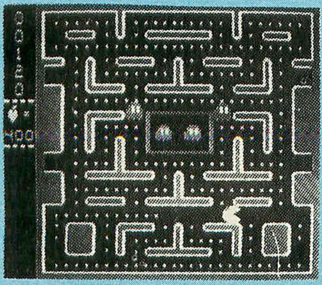
JOYSTICKS REQUIRED

32K MACH. LANGUAGE

TAPE $24.95

DISK $27.95





MS. MAZE

MS. MAZE is remarkable in that it combines brilliant color, high resolution, detailed graphics, and music with a very playable game. Anything that could be done to make the Color Computer look and play like the arcade version has been done. MS. MAZE is without question the closest thing to the arcade Pac games that I have seen for the Coco.

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

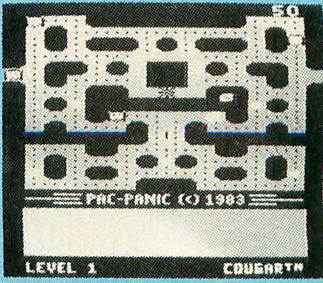
TAPE $24.95 **DISK $27.95**

PAK-PANIC

Pakman is steered thru a maze eating dots and powerpills. Pakman is pursued by four monsters who try to catch and kill him. If Pakman eats a powerpill he becomes powerful and can eat monsters. Monsters try to avoid a powerful Pakman. As monsters are eaten their ghosts appear on the top of the screen. When seven ghosts have appeared one will fly across the screen or they will link together forming a centipede that will travel thru the maze. Pakman has no power against ghosts and centipedes and must avoid them or be killed. **JOYSTICKS REQUIRED**

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**



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VIP Database™
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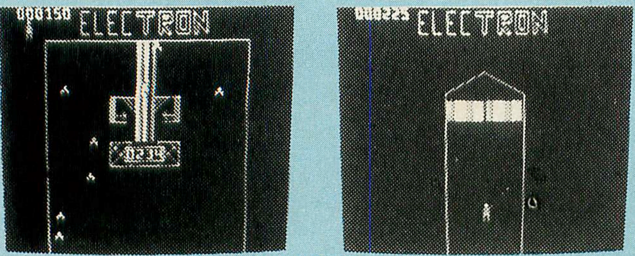
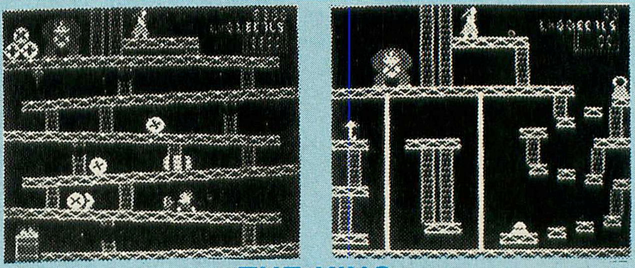
VIP Disk-ZAP™
Repairs crashed disks.
16K DISK $49.95 Lowercase displays not available with this program.



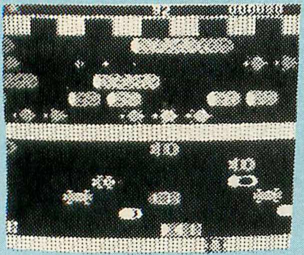
ELECTRON

Electron is composed of four subgames. You must complete one level in order to advance to the next. Supplied with four men, you are subjected to more difficult games as you move ahead. Beam Buggy, Prachnids, Force Fields and a Maze!
JOYSTICKS REQUIRED, 16K MACHINE LANGUAGE
TAPE $24.95 DISK $27.95



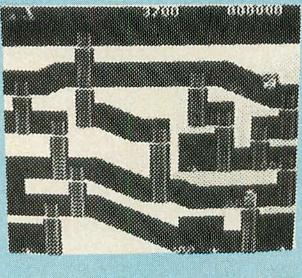
THE KING

This game contains all 4 full graphic screens like the popular arcade game. Exciting sound and realistic graphics. Never before has the color computer seen a game like this. Early reviews say simply outstanding. **JOYSTICKS REQUIRED**
32K MACHINE LANGUAGE
TAPE $26.95 DISK $29.95



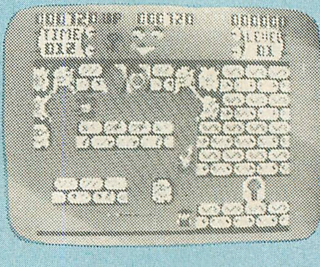
THE FROG

This one will give you hours of exciting play. Cross the busy highway to the safety of the median and rest awhile before you set out across the swollen river teaming with hidden hazards. Outstanding sound and graphics. Play from keyboard or joysticks.
16K MACHINE LANGUAGE
TAPE $27.95 DISK $30.95



KING TUT

Journey through the caverns of King Tut's tomb. You are on a quest to find treasures hidden in the cavrns below. You light your way with only a small candle that grows dimmer as time passes. Watch out for the snakes and the ghost of King Tut himself. Five screens challenge your abilities every step of the way. Joysticks required.
16K MACHINE LANGUAGE
TAPE $27.95 DISK $30.95



THE TOUCHSTONE

You are one of many priests of Ra who has accepted the challenge of the touchstone. The challenge is a way for any of Ra's followers to become a favored high priest. Given limited use of Ra's powers, you will battle hidden dangers. Entering the mazes, you must be ready for anything.
32K MACHINE LANGUAGE
TAPE $27.95 DISK $30.95

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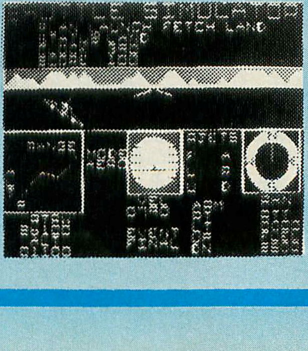

SPACE SHUTTLE

This program gives you the real feeling of flight. Full instrumentation complete to the max. Radar, altimeter, air speed, artificial horizon, fuel gauge, a mission status panel and much more. Actual simulation of space flight, weather conditions must be considered.
JOYSTICKS REQUIRED
32K EXTENDED BASIC
TAPE $28.95 DISK $31.95

EDUCATIONAL

VOCABULARY MANAGEMENT SYSTEM

16K Extended basic/32K for printer output TAPE $39.95 DISK $42.95

The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 9 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

—As many as 300 vocabulary words and definitions may be in the computer's memory at one time.
—Words and definitions may be saved on disk or tape.
—Remarks and/or comments can be saved with word files.
—A disk loading menu allows students to load disk files without typing file names.
—Word lists may be quickly alphabetized
—The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.
—Answer keys may be printed for all worksheets and puzzles.
—The printer segments allow full use of your printer's special features.
—The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fast-paced set of activities.

STORY PROBLEMS

STORY PROBLEMS is a program that is designed to give practice in solving story problems (sometimes called statement thought or word problems) on the Color Computer. It is suitable for use in either a home or school environment. It is also a tool that will allow you to create new story problems to suit your children's needs and ability levels. It has many features that make it particularly attractive:

- Story problems involving addition, subtraction, multiplication, division or a combination of the four are presented to the student by slowly scrolling each letter of each problem onto the screen.
- Up to 5 students may use the program at the same time.
- There are 4, user modifiable, skill levels.

16K EXT. BASIC TAPE $19.95 DISK $22.95

MATH DRILL

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication and division skills on the Color Computer. It has several features that make its use particularly attractive:

- Up to 6 students may use the program at the same time.
- Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- Commas may be included in the answers.
- Partial products for the multiplication problems may be computed on the screen.
- Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- The are ten, user modifiable, skill levels.
- A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- Skill levels automatically adjust to the student's ability.
- A timer measures the time used to answer each problem and the total time used for a series of problems.
- After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.

REQUIRES 16K EXT. BASIC
TAPE $19.95 DISK $22.95

ESTIMATE

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the Color Computer. It has many features that make its use particularly attractive:

- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that a child will not inadvertently stop the program from running.

REQURIES 16K EXT. BASIC
TAPE $19.95 DISK $22.95

TEACHER'S DATABASE

TEACHER'S DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive:

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted.

REQURES 32K EXT. BASIC
TAPE $39.95 DISK $42.95

PRE-ALGEBRA I INTEGERS

INTEGERS is a series of four programs designed to give students practice in working with addition, subtraction, multiplication, division and the comparison of integers. It has many features that make a very valuable tool for introducing and/or maintaining skills:

- Up to 4 students may use the program at the same time.
- There are 9, user modifiable, skill levels.
- Students are given two opportunities to answer a problem.
- A detailed report of student performance, including number correct on first try, number wrong, total time used and percentage score, is presented at the end of a series of problems.
- The programs will run on a 16K TRS-80 Color Computer with or without disk drive.

Four distinct problem formats are presented. The first presents problems in this format: − 12 + − 9 = ?. The second program presents a problem with missing numerals in this format: − 7 − ? = 18. The third program presents a problem with a missing sign: 8 − ?6 = 14. The last program asks the student to determine the relationship (= , or) between two statments 3 − 9 (??) − 4 − 5.

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Cooking With CoCo

PART II

In which we construct a simple plug-in cartridge programmer for the 2764 8K EPROM.

By Colin J. Stearman

This month we continue to build the tools needed to enhance the CoCo Disk Operating System (DOS). Last month we developed a means to store the complete BASIC operating system on a special system floppy disk. Now I will describe a simple construction project to build a plug-in programmer for one of the most popular (and hence cheapest!) 8K EPROM's currently available — the 2764. The primary purpose of this project is to allow us to put the modifications into an EPROM which will replace the ROM containing the original DOS. But once built, the programmer can be used to put any code you wish into a 2764.

Design Philosophy

I'm a firm believer in the "KISS" principle I learned many years ago ("Keep It Simple, Stupid!"). So this programmer uses three integrated circuits, a transistor and a few resistors and capacitors. The bulk of the work is done by the driving software. This means there are no timing circuits or other complex logic to worry about. The result is a simple project to build and get working.

Circuit Description

I do not propose to provide a long description of how a

(Colin J. Stearman is an electronics engineer educated in the U.K. He has worked with all kinds of computers and has been a CoCo enthusiast for over two years.)

2764 is programmed. In general, it is programmed by presenting the address and data to the chip, then pulsing the program input pin while supplying 21 volts to another.

If you look at the schematic in Figure 1, you will see that the key to the programmer's simplicity lies in the two 6821 peripheral interface adapters (PIA). These are the same chips used inside the CoCo for interfacing with the outside world. These two chips provide the 2764 with all address and data information along with other control lines. The only other chip is an inverting buffer to decode the address information to the PIAs.

One of the PIA outputs drives a transistor which activates a relay to control the 21-volt source. It's not the most elegant way of doing it, but certainly the simplest. A light emitting diode (LED) tells you when the programmer is programming. The diode around the relay suppresses transients during switching and the other two stop currents flowing to the wrong places. The capacitors are all for power supply filtering. These are not shown in Figure 1 for clarity. Locate a 0.1uF disk capacitor from +5V to 0V at each integrated circuit (polarity is not important) and one 10uF 12V electrolytic capacitor anywhere on the board across these same lines (polarity is important here, the wire labelled "+" goes to the +5V line).

The PIA is a programmable device and its external connections may be programmed as inputs or outputs. This makes it possible for the software to both program the 2764 and then read back the resulting data.

The 21 volt source is easily obtained from three nine-volt batteries and a few other components as shown in Figure 1. This circuit is not built on the board and may not be needed if you already have an adjustable power supply.

Finally, the two sockets shown at U4 and U5 have nothing to do with the programmer itself, but provide a convenient method of putting two programmed 2764s into the CoCo memory map. One socket is wired to fill the address space from $C000 to $DFFF and the other from $E000 to $FFFF. (The last 256 bytes are not accessible in the latter because the addresses $FF00 to $FFFF are used internally as system input/output and vector addresses.)

Construction Hints

Radio Shack sells a printed circuit breadboard with the correct 40-pin edge connect for the CoCo expansion port. Check the parts list in Figure 1 for the number. This board is ideal for the project. The photograph shows the construction method I used. The components were conveniently laid out and then hooked up using a combination of the copper tracks on the board and solid hook-up wire. Maybe it's not the most elegant, but it's serviceable and functional. You could lay out and etch a custom printed circuit board and make a more professional job if you wished.

Take your time during the construction! The finished project will be plugged into your precious CoCo and could cause some nasty problems if you make an error. Use a meter or continuity tester to make sure you have wired correctly and that there are no shorts. The most likely cause of damage is having the power supply voltages coming out of CoCo going to the wrong places. The only internal supply used is the five-volt source from pin nine of the connector so check this line carefully. Pins one and two, which supply -12 volts and +12 volts are not used, so make sure they do not go anywhere on your board. Check Figure 2 for the edge connector pin numbering.

Source For Components

Those parts available from Radio Shack have been listed in Figure 1. The PIAs and 2764s are not available from them, nor is the Zero Insertion Force (ZIF) socket. The ZIF socket is not essential but is a good idea as it saves wear and tear on the 2764s. Most mail order houses can supply these components and I can recommend ACTIVE Electronics (800-343-0874) in Westboro, Mass. as a reputable firm. When ordering the 2764 ask for the 2764-3 which has an access time of 300nS. This is fast enough to work in the familiar "speed-up mode" that some CoCo programs use. An enclosure for the board can be obtained from The Microworks or Colorware who both advertise in RAINBOW.

The only other major item you might want to consider is an EPROM eraser. EPROMs are erased by exposure to ultraviolet light and can usually be programmed and erased many times. It is probable that you will wish to erase an EPROM you have programmed at some point and will need an eraser. If you live in the Sun Belt you might try leaving them outside in the sun for a week or two. But if you live in the north like me and forget what the sun looks like you'll have to buy an eraser. Hobby models are available for around $60 (also from ACTIVE). They do the job in about 15 minutes and can erase 15 chips at once. UV is dangerous to the eyes and skin and these inexpensive models have no safety interlocks, so if you get one treat it with respect and NEVER look into the lighted lamp.

> **"Take your time during the construction! The finished project will be plugged into your precious CoCo and could cause some nasty problems if you make an error."**

Software

Listing 1 shows the source code for the EPROM programmer. It is fully position independent and is an ideal candidate for loading into an EPROM. I put such a programmed EPROM into one of the sockets on the board so that the cartridge had both the hardware and software ready to go.

The program is menu driven and provides a variety of functions. Menu selection one will verify that all locations in the EPROM are erased. A colored bar shrinks as the EPROM is checked and if fully erased, this is reported. If not, the first unerased memory location is reported and the checking process stops. An EPROM is fully erased when all memory bits are a one. The programming process can only convert 1s to 0s, not the reverse. You can program a partially erased EPROM however, as long as the memory locations you do wish to program are erased.

Menu item two allows the data stored in any section of CoCo's memory to be programmed into the EPROM. This does not have to be the whole 8K and can be as little as one byte. All memory addresses are entered as hexadecimal and the EPROM memory locations are numbered from $0000 to

$1FFF. As the programming proceeds, the cell being programmed is indicated and also automatically verified. If a cell does not return the same data as was programmed in it, the address is shown and a "BAD EPROM" message issued. If it is just not erased, this will be reported as such. In either case the programming stops.

The third menu item allows the contents of the EPROM to be dumped as a hexadecimal and ASCII character table. This is useful for inspecting the contents of the EPROM. The EPROM start and stop addresses are supplied and the output can be directed to the screen or printer. If the screen is chosen, the output will pause and wait for any key-press after each screen is filled. In either case the BREAK key will stop output and return to the request for dump range. Pressing the ENTER key for this returns to the main menu.

Menu item four permits individual inspection and programming of EPROM memory locations. The up and down arrows scan through consecutive memory locations displaying their contents. If a new value is entered an attempt is made to program that cell. This is done by pressing the 'P' key at the appropriate address and then entering the data. Sometimes it is possible to correct minor errors in a programmed EPROM this way. A new address may be selected by pressing 'N' and entering the desired address. 'X' will return to the main menu.

The fifth menu item will return the load start and end addresses of a cassette binary file, along with the execution address. This is used to find out where a binary file from tape went in memory so that it can be transferred to the EPROM. This display does not take into account any load offset you might have used in the *CLOAD* command.

Menu item six simply returns you back to BASIC.

"When all 8K have been checked the 2764 will be declared fully erased. Pressing ENTER will return you to the menu. If you get this far, things are looking pretty good."

Assembling the Program

As I mentioned in the previous installment, I use *MAC* by Computerware as my assembler. However, many of you may have *EDTASM+* or some other brand. Generally they are compatible, but there are some differences. For example, MAC allows binary numbers in the operand field. These are preceded by a percent sign. For other assemblers simply figure out what the number is in hexadecimal and enter it with a dollar sign in front instead.

MAC also has an FCS (Form Constant String) mnemonic. This is similar to FCC (Form Constant Characters), but allows hexadecimal codes to be imbedded in the string by enclosing them in angle brackets. Also it automatically adds a zero byte at the end of the string. Every FCS instruction can be replaced by a series of FCC and FCB (Form Constant Byte) mnemonics. For example, this line:

```
FCS /<OD> Sample program <OD>Enter?/
```

would become:

```
FCB $0D return
FCC /Sample program/
FCB $OD return
FCC /Enter?/
FCB 0 terminating zero byte
```

You may also see mnemonics OPT, NAM and TTL in the listings. These are just directives to *MAC* and can be omitted.

Once you have entered the source code and it assembles without error, save a copy of the machine code binary file to a cassette. This will be needed to first "fire up" the programmer as the disk system will be disconnected.

Testing the Project

After you have thoroughly checked the circuit board for errors there is nothing else but to plug it in and try it. If you have a meter you might monitor a five-volt point somewhere on the board before powering up. Owners of the Multi-Pak Interface should plug the programmer into slot one and select this on the front switch. If you do not own one, remove the disk controller and plug the programmer directly into the computer.

Now cross your fingers and power up. (If you have the Multi-pak, just power that up and verify the five-volt line with your meter first.) Now power up CoCo. If the screen does not clear and the copyright notice does not appear in the normal time, power down immediately and further check your construction.

If everything is alright so far, *CLOADM* and *EXEC* the programmer driver software from your cassette. The title and menu should appear. If not, recheck your typing of the source code.

Without a 2764 in the ZIF socket, select menu item one. If the programmer is working you will see a purple horizontal bar which shrinks from the right as each of the 1024 bytes are verified. (If there is no 2764 chip in the socket, it looks like a fully erased chip to the programmer.) When all 8K have been checked the 2764 will be declared fully erased. Pressing ENTER will return you to the menu. If you get this far, things are looking pretty good.

Now try menu item five and verify that the start, end and execute addresses of the programmer software just loaded from cassette are returned. Make a note of these numbers.

Next is a dry run at programming. Connect the 21.5 volt external source using clip leads. Still without a 2764 in the ZIF socket, select menu item two. For the start and end address in RAM use the start and end address from the previous steps. For the EPROM target address use 0. As soon as you enter the zero, the program will announce the attempt to program the EPROM at address zero and then indicates you have a bad EPROM at the location. As you have not plugged in an EPROM, this is to be expected. You should have heard the relay actuate briefly and the LED may have flashed on momentarily. Press ENTER twice to return to the main menu. Things are still looking good.

Now plug in an erased 2764 into the ZIF socket. Use menu item one to verify it is erased. If so, return to menu item two and reenter the RAM start and end values as before. Target the code to begin at EPROM address $0000. When you press ENTER the relay should "click" in and the LED come on. As each address is programmed its EPROM address is shown on the screen. Remember that data for each address is being verified as it goes along, so there is little likelihood of wrong data being programmed in, unless it was wrong in the first place. It takes 50mS to program each location, so an entire 8K takes a little over six minutes. This is not a limitation of the software but rather a requirement of the EPROM. The programmer software is not 8K long so will not take that long.

When the last byte of the block has been programmed, the addresses of the range of bytes programmed is displayed. Pressing ENTER once would allow you to program another part of this EPROM or another one. (You could put some other program in the unused portion of the EPROM just programmed, if you wish.) Pressing ENTER again returns you to the main menu.

It would be a good idea to dump the data just programmed to double check it. This is done with menu item three. Dump the range programmed and spot check the data for errors. It should be alright.

Now power down the system and remove the 2764 from the ZIF socket and put it into the spare socket on the programmer labelled *$E000 - $FEFF.* Power up again and type in *EXEC&HE000.* The EPROM programmer software should immediately start up.

If you got this far without problems I think you can breathe a sigh of relief. . . the unit seems to be working fine. If not, check and double check everything and after all else fails, drop me a line and a SASE and I'll try to figure out what went wrong.

Using the Programmer with the Disk

It is a good idea to get a copy of the unmodified Disk BASIC on to a cassette and if you have the Multi-Pak to also put it into an erased EPROM. The latter is the case because the Multi-Pak Interface allows you to use the programmer with the disk system. Put the disk controller in slot four and the programmer in slot one. Initially select slot four.

To save disk BASIC to cassette, with the disk system running and a blank cassette in the tape drive, type:
CSAVEM"DBASIC",&HC000,&HDFFF,&HA027.

If you have the Multi-Pak interface, the next few steps will put Disk BASIC into an EPROM so that it can be put into the other socket on the programmer. If you don't have this interface there is little point in doing this as the CoCo cannot have the programmer and disk controller available to it at the same time. However, Disk BASIC on a cassette will come in useful later.

For those with the interface, continue by powering down and selecting slot one. Then power up to Extended Color BASIC. Type in the following commands:

```
CLEAR 200,&H3FFF
CLOADM"DBASIC",&H4000-&HC000+65536
EXEC &HE000
```

Assuming you have the programmer software in an EPROM in the socket as $E000, it should start up and you can program a fully erased 2764 with the data stored in RAM at $4000 though $5FFF. This, of course, is Disk BASIC.

When the EPROM is programmed, power down and put the EPROM in the other socket on the programmer ($C000 to $EFFF, the normal addresses for Disk BASIC). With the selector still in position one, power up the system. You should get the normal Disk Extended Color BASIC banner. You are now running Disk BASIC from the EPROM. However, it will not work properly because the secondary chip select signal is going to slot one (because of the position of the switch) and it needs to go to the controller in slot four. This is accomplished by entering *POKE 65407,3.* Now the system will act normally until you press Reset. Then you'll have to do this *POKE* again.

You can now load machine code files from disk and then activate the programmer code. This is done by redirecting the secondary chip select to slot one with a *POKE65407,0,* then *EXEC&HE000* to start up the programmer code. Menu item six returns to Disk BASIC where the secondary chip select can once again be directed to slot four.

Wrapping It Up

If this was your first construction project and you got here with no problem, congratulations — you are now a qualified "hardware hacker." For those "old hands" this should have made a simple but rewarding project.

We now have all the necessary tools to enhance the DOS, so next month we will start that in earnest by revising some commands and maybe adding one or two new ones. Until then!

Listing 1:

```
EPROM.MAC                       COMPUTERWARE MACRO ASSEMBLER  PAGE 1
2764 EPROM PROGRAMMER By C.J.STEARMAN (C)1984


                0001 *********************************************
                0002 *     E P R O M   P R O G R A M M E R       *
                0003 *                 B Y                       *
                0004 *      C O L I N   S T E A R M A N          *
                0005 *                                           *
                0006 *           (C)1984 C.J.Stearman            *
                0007 *********************************************
                0008 *
                0009 *  THIS IS POSITION INDEPENDENT
                0010 *
                0011 *
                0012 *
                0013 ******************************
0E00            0014         ORG   $E00
                0015 *
                0016 *
                0017 *********************************************
                0018 * SOME EQUATES
                0019 *
A928            0020 CLEAR  EQU   $A928        BASIC CLEAR SCREEN ROUTINE
01DA            0021 BUFFER EQU   $1DA         USES THE CASSETTE BUFFER
```

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```
0008              0022 NUMK   EQU   8             NUMBER OF K IN EPROM
1FFF              0023 TOPADD EQU   (NUMK*1024)-1 TOP EPROM ADDRESS
                  0024 *
                  0025 *
                  0026 *********************************************
                  0027 *
                  0028 *  MAINLINE OF PROGRAM
                  0029 *
                  0030 *
0E00 170138       0031 EPROM  LBSR  INIT           SET UP THE PIAS
                  0032 * NORMAL EPROM MODE IS TO READ THE EPROM
0E03 BDA928       0033 MENU   JSR   CLEAR         CLEAR SCREEN
0E06 308D0043     0034        LEAX  MENUT,PCR     POINT TO MENU TEXT
0E0A 17094E       0035        LBSR  OUTST$        OUTPUT THE MENU
                  0036 *
                  0037 *GET RESPONSE
0E0D 1708FA       0038        LBSR  INSTR$        GET RESPONSE INTO BUFFER
                  0039 * FIRST SEE IF ONLY 1 CHARACTER ENTERED
0E10 B601DC       0040        LDA   BUFFER+2      SHOULD BE ZERO
0E13 26EE         0041        BNE   MENU          IT WASNT
0E15 B601DA       0042        LDA   BUFFER        GET FIRST CHARACTER IN BUFFER
0E18 8131         0043        CMPA  #'1           VERIFY ERASE
0E1A 2605         0044        BNE   .COPY
0E1C 17021F       0045        LBSR  ERASE
0E1F 20E2         0046        BRA   MENU
0E21 8132         0047 .COPY  CMPA  #'2           COPY RAM
0E23 2605         0048        BNE   .DUMP
0E25 170318       0049        LBSR  COPY
0E28 20D9         0050        BRA   MENU
0E2A 8133         0051 .DUMP  CMPA  #'3           DUMP EPROM
0E2C 2605         0052        BNE   .CELL
0E2E 170543       0053        LBSR  DUMP
0E31 20D0         0054        BRA   MENU
0E33 8134         0055 .CELL  CMPA  #'4           INDIVIDUAL CELL PROGRAM
0E35 2605         0056        BNE   .FILE
0E37 1706C8       0057        LBSR  CELL
0E3A 20C7         0058        BRA   MENU
0E3C 8135         0059 .FILE  CMPA  #'5           CASSETTE FILE DATA RETURN
0E3E 2605         0060        BNE   .BASIC
0E40 170818       0061        LBSR  CFILE
0E43 20BE         0062        BRA   MENU
0E45 8136         0063 .BASIC CMPA  #'6           IS IT EXIT TO BASIC?
0E47 26BA         0064        BNE   MENU          NO SO DO MENU AGAIN
0E49 BDA928       0065        JSR   CLEAR         BEFORE GOING TO BASIC
0E4C 39           0066        RTS                 EXIT FOR CHECK SO FAR
                  0067 *
0E4D 45           0068 MENUT  FCC   /E P R O M   P R O G R A M M E R/
0E4E 2050205220
0E53 4F204D2020
0E58 2020502052
0E5D 204F204720
0E62 522041204D
0E67 204D204520
0E6C 52
0E6D 3D           0069        FCC   /================================/
0E6E 3D3D3D3D3D
0E73 3D3D3D3D3D
0E78 3D3D3D3D3D
0E7D 3D3D3D3D3D
0E82 3D3D3D3D3D
0E87 3D3D3D3D3D
0E8C 3D
0E8D 0D0D         0070        FDB   $0D0D         TWO <CR>
0E8F 20           0071        FCC   /  1 - VERIFY ERASURE/
0E90 2031202D20
0E95 5645524946
0E9A 5920455241
0E9F 53555245
0EA3 0D           0072        FCB   $0D
0EA4 20           0073        FCC   /  2 - PROGRAM EPROM FROM MEMORY/
0EA5 2032202D20
0EAA 50524F4752
0EAF 414D204550
0EB4 524F4D2046
0EB9 524F4D204D
0EBE 454D4F5259
0EC3 0D           0074        FCB   $0D
0EC4 20           0075        FCC   /  3 - DUMP EPROM CONTENTS/
0EC5 2033202D20
0ECA 44554D5020
0ECF 4550524F4D
0ED4 20434F4E54
0ED9 454E5453
0EDD 0D           0076        FCB   $0D
0EDE 20           0077        FCC   /  4 - PROGRAM INDIVIDUAL CELLS/
0EDF 2034202D20
0EE4 50524F4752
0EE9 414D20494E
0EEE 4449564944
0EF3 55414C2043
0EF8 454C4C53
0EFC 0D           0078        FCB   $0D
0EFD 20           0079        FCC   /  5 - CASSETTE FILE DATA/
0EFE 2035202D20
0F03 4341535345
0F08 5454452046
0F0D 494C452044
0F12 415441
0F15 0D           0080        FCB   $0D
0F16 20           0081        FCC   /  6 - RETURN TO BASIC/
0F17 2036202D20
0F1C 5245545552
0F21 4E20544F20
0F26 4241534943
0F2B 0D0D         0082        FDB   $0D0D
0F2D 20           0083        FCC   /  SELECTION? /
0F2E 2053454C45
0F33 4354494F4E
0F38 3F20
0F3A 00           0084        FCB   0             MESSAGE TERMINATOR
                  0085 *
                  0086 *
                  0087 *********************************************
                  0088 *******************************************
                  0089 *  EPROM ACCESS ROUTINES
                  0090 *******************************************
                  0091 *
                  0092 *
FF41              0093 CONREG EQU   $FF41         LOWEST CONTROL REGISTER
FF44              0094 LOWADD EQU   $FF44         LOW ADDRESS OUTPUT
FF46              0095 HIADD  EQU   $FF46         HIGH ADDRESS OUTPUT
FF40              0096 DATARG EQU   $FF40         DATA REGISTER
FF42              0097 CLINES EQU   $FF42         CONTROL LINES REGISTER
FF43              0098 VOLTS  EQU   $FF43         RELAY CONTROL REGISTER
                  0099 *
                  0100 *
                  0101 *******************************************
                  0102 *  INITIALIZING ROUTINE
                  0103 *
0F3B 4F           0104 INIT   CLRA                EXPOSE ALL THE DDRS
0F3C 8D1F         0105        BSR   DDRSET
                  0106 *
                  0107 *  NOW ALL DATA DIRECTION REGISTERS ARE EXPOSED
                  0108 *
0F3E C6FF         0109        LDB   #$FF          SET ALL ADDRESS LINES TO OUTPUTS
0F40 F7FF44       0110        STB   LOWADD
0F43 F7FF46       0111        STB   HIADD
                  0112 *
0F46 C607         0113        LDB   #7            SE CONTROL LINES TO OUTPUTS
0F48 F7FF42       0114        STB   CLINES
                  0115 *
0F4B 7FFF40       0116        CLR   DATARG        TO MAKE IN INPUTS
                  0117 *
0F4E 8604         0118        LDA   #4            RESET THE CONTROL REGISTERS
0F50 8D0B         0119        BSR   DDRSET        TO OUTPUTS
                  0120 *
0F52 8634         0121        LDA   #$34          SET CONTROL REG FOR RELAY OUTPUT
0F54 B7FF43       0122        STA   VOLTS         ENABLES CB2 AS OUTPUT AT ZERO
                  0123 *
0F57 8601         0124        LDA   #1            SET UP CONTROL LINES FOR READ
0F59 B7FF42       0125        STA   CLINES         OE,CS=0 PGM=1
                  0126 *
0F5C 39           0127        RTS
                  0128 *
                  0129 **
                  0130 ******* SUBROUTINES ********
                  0131 *  SET CONTROL REGISTERS TO CONTENTS OF A
0F5D C604         0132 DDRSET LDB   #4            # OF CONTROL REGISTERS
0F5F 8EFF41       0133        LDX   #CONREG       POINT X TO CONTROL REGISTERS
0F62 A781         0134 CLRREG STA   ,X++          CLEAR AND DOUBLE INCREMENT
0F64 5A           0135        DECB                DECREASE COUNTER
0F65 26FB         0136        BNE   CLRREG        DO NEXT REGISTER
0F67 39           0137        RTS
                  0138 *******************************************
                  0139 *
                  0140 *
                  0141 *******************************************
                  0142 *    PROGRAM EPROM ROUTINE
                  0143 *******************************************
                  0144 *
                  0145 * THIS PROGRAMS THE PROM FROM DATA STARTING
                  0146 * AT ADDRESS IN "START", FOR THE NUMBER OF
                  0147 * BYTES IN "COUNT",AT EPROM ADDRESS "TARGET"
                  0148 * THESE LOCATIONS ARE RESERVED IN THIS ROUTINE
                  0149 * START ENDS UP WITH LAST ADDRESS DATA WAS
                  0150 * TAKEN FROM RAM.  TARGET HAS LAST ADDRESS
                  0151 * WRITTEN TO IN EPROM.
                  0152 * B HAS ERROR CODE
```

```
               0153 *  1= NCT ERASED
               0154 *  2= BAD EPROM LOCATION
               0155 *  0= NO PROBLEM
               0156 ***********************************************
               0157 *
01D1           0158 START  EQU   $1D1        USED CASSETTE NAME AREA
01D3           0159 COUNT  EQU   START+2
01D5           0160 TARGET EQU   START+4
               0161 *
0F68 B6FF43    0162 PROGRM LDA   VOLTS       GET REG VALUE
0F6B 8A08      0163        ORA   #%00001000  SET BIT 8 TO APPLY 21V
0F6D B7FF43    0164        STA   VOLTS
               0165 *  21V IS NOW APPLIED
               0166 * WAIT A WHILE FOR RELAY TO CLOSE
0F70 8EFFFF    0167        LDX   #$FFFF
0F73 301F      0168 RLYDLY LEAX  -1,X        DECREMENT X
0F75 26FC      0169        BNE   RLYDLY
               0170 *
               0171 *  PRESERVE Y AND U REGISTERS
0F77 3460      0172        PSHS  U,Y
               0173 *
               0174 *
0F79 10BE01D1  0175        LDY   START       POINT Y TO RAM START
0F7D FE01D5    0176        LDU   TARGET      POINT U TO TARGET
0F80 5F        0177        CLRB
0F81 BE01D3    0178        LDX   COUNT       GET BYTE COUNT
0F84 1027009D  0179        LBEQ  PREXIT      ALL DONE PROGRAMMING
               0180 *
               0181 * MOVE CURSOR AHEAD 4
0F88 FC0088    0182        LDD   CURLOC
0F8B C30004    0183        ADDD  #4
0F8E FD0088    0184        STD   CURLOC
               0185 ************************
               0186 *    PROGRAMMING LOOP
0F91 1F30      0187 PLOOP  TFR   U,D         SET UP EPROM ADDRESS
0F93 3341      0188        LEAU  1,U         INCREMENT EPROM ADDRESS
0F95 B7FF46    0189        STA   HIADD
0F98 F7FF44    0190        STB   LOWADD
               0191 *
               0192 * DISPLAY WORKING ADDRESS
0F9B 3436      0193        PSHS  Y,X,D
0F9D FC01D3    0194        LDD   COUNT       DONT IF IT IS 1
0FA0 10830001  0195        CMPD  #1
0FA4 270F      0196        BEQ   NODISP      NO DISPLAY
0FA6 ECE4      0197        LDD   ,S          RECOVER VALUE IN D
0FA8 BE0088    0198        LDX   CURLOC      MOVE CURSOR BACK 4
0FAB 301C      0199        LEAX  -4,X
0FAD BF0088    0200        STX   CURLOC
0FB0 1F01      0201        TFR   D,X          MOVE VALUE TO X
0FB2 170816    0202        LBSR  HEXOUT      DISPLAY IT
0FB5 3536      0203 NODISP PULS  Y,X,D       RECOVER VALUES
               0204 * GET DATA TO BE LOADED INTO REG B
0FB7 E6A0      0205        LDB   ,Y+         AND INCREMENT ADDRESS
               0206 *
0FB9 B6FF40    0207        LDA   DATARG      GET DATA AT THIS ADDRESS
0FBC 81FF      0208        CMPA  #$FF        SHOULD BE THIS
0FBE 2704      0209        BEQ   EMPTY
0FC0 C601      0210        LDB   #1          NOT ERASED CODE
0FC2 2046      0211        BRA   PEXIT
               0212 *
0FC4 B6FF42    0213 EMPTY  LDA   CLINES      GET CONTROL LINES
0FC7 8A02      0214        ORA   #%00000010  RAISE OE
0FC9 B7FF42    0215        STA   CLINES
               0216 *
0FCC 7FFF41    0217        CLR   CONREG      MAKE DATA LINES OUTPUTS
0FCF 86FF      0218        LDA   #$FF
0FD1 B7FF40    0219        STA   DATARG
0FD4 8604      0220        LDA   #4          RESET TO OUTPUT REG
0FD6 B7FF41    0221        STA   CONREG
               0222 *
               0223 *  SAVE DATA IN B IN  EPROM
0FD9 F7FF40    0224        STB   DATARG      PUT ON DATA LINES
               0225 *
0FDC 8D41      0226        BSR   PULSE       THE PGM LINE LOW
               0227 *
               0228 *NOW VERIFY
0FDE 7FFF41    0229        CLR   CONREG      MAKE DATA LINE INPUTS
0FE1 7FFF40    0230        CLR   DATARG
0FE4 8604      0231        LDA   #4
0FE6 B7FF41    0232        STA   CONREG
               0233 *
               0234 * ENABLE CHIP
0FE9 B6FF42    0235        LDA   CLINES
0FEC 84FD      0236        ANDA  #%11111101   OE LOW
0FEE B7FF42    0237        STA   CLINES
               0238 *
               0239 * NOW COMPARE DATA ON DATARG WITH CONTENTS AT Y
0FF1 F1FF40    0240        CMPB  DATARG      DATA WAS LEFT IN B FROM LOAD
0FF4 2704      0241        BEQ   VERIOK      IT WAS THE SAME
```

```
0FF6 C602      0242        LDB   #2          VERIFY ERROR CODE
0FF8 2010      0243        BRA   PEXIT
               0244 *
               0245 *    END PROGRAMMING LOOP
               0246 ************************
0FFA AD9FA000  0247 VERIOK JSR   [POLCAT]    BREAK PRESSED?
0FFE 2705      0248        BEQ   DOWNCT       NO SO DECREASE COUNT
1000 5F        0249        CLRB              READY FOR RETURN CODE
1001 8103      0250        CMPA  #3          BREAK VALUE
1003 2705      0251        BEQ   PEXIT       YES SO EXIT
1005 301F      0252 DOWNCT LEAX  -1,X        REDUCE COUNT
1007 2688      0253        BNE   PLOOP       NOT DONE YET
1009 5F        0254        CLRB              NO ERROR CODE
100A 335F      0255 PEXIT  LEAU  -1,U        DECREASE TO LAST LOADED ADDRESS
100C FF01D5    0256        STU   TARGET
100F 313F      0257        LEAY  -1,Y        DO SAME FOR RAM ADDRESS
1011 10BF01D1  0258        STY   START       SAVE LAST RAM ADDRESS
1015 B6FF43    0259 PREXIT LDA   VOLTS       GET VOLTS REGISTER
1018 84F7      0260        ANDA  #%11110111  TURN OFF 21V
101A B7FF43    0261        STA   VOLTS
101D 35E0      0262        PULS  U,Y,PC      RECOVER REGISTERS & RETURN
               0263 *
               0264 ******************************************
               0265 *
               0266 * THIS PULSES THE PGM LINE LOW FOR 50MS
               0267 *
101F B6FF42    0268 PULSE  LDA   CLINES      GET LINES
1022 84FE      0269        ANDA  #%11111110  MAGE PGM LOW
1024 B7FF42    0270        STA   CLINES
               0271 *
1027 3410      0272        PSHS  X           FOR DELAY COUNT
1029 1A50      0273        ORCC  #%01010000  PREVENT INTERRUPTS
102B 8E1600    0274        LDX   #$1600      FOR 50 MS
102E 301F      0275 DLOOP  LEAX  -1.X        REDUCE COUNT
1030 26FC      0276        BNE   DLOOP       KEEP LOOPING
1032 1CAF      0277        ANDCC #%10101111  ALLOW INTERRUPTS
               0278 *
1034 B6FF42    0279        LDA   CLINES      GET LINES
1037 8A01      0280        ORA   #%00000001  SET PGM HI
1039 B7FF42    0281        STA   CLINES
103C 3590      0282        PULS  X,PC        RECOVER X AND RETURN
               0283 ******************************************
               0284 *******************************************
               0285 *      VERIFY   ROUTINE       *
               0286 *******************************************
               0287 *
               0288 * THIS VERIFIES ERASURE OF THE EPROM
               0289 * PROVIDES A GO/NOGO RESPONSE
               0290 * OF ERASURE OF ENTIRE EPROM
               0291 *
103E BDA928    0292 ERASE  JSR   CLEAR       CLEAR SCREEN
1041 3420      0293        PSHS  Y           PRESERVE REGISTER Y
1043 309D007B  0294        LEAX  ERAMSG,PCR  PUT UP TITLE
1047 170711    0295        LBSR  OUTST$
               0296 *
               0297 *PUT UP PROGRESS MONITOR
104A BE0088    0298        LDX   CURLOC      GET CURSOR LOCATION
104D 3008      0299        LEAX  NUMK,X      MOVE OVER NUMBER OF K IN EPROM
104F BF0088    0300        STX   CURLOC      AND SAVE IT
1052 CCBFBF    0301        LDD   #$BFBF      2 RED SQUARES
1055 108E0008  0302        LDY   #NUMK       COUNTER
1059 ED81      0303 PUTMON STD   ,X++        STORE ON SCREEN
105B 313F      0304        LEAY  -1,Y        DECREASE COUNT
105D 26FA      0305        BNE   PUTMON
               0306 *
105F 108E0000  0307        LDY   #0          START ADDRESS
1063 AD9FA000  0308 VLOOP  JSR   [POLCAT]    TEST FOR BREAK
1067 2706      0309        BEQ   NOBRK       HE KEY PRESSED
1069 8103      0310        CMPA  #3          BREAK?
106B 2602      0311        BNE   NOBRK
106D 35A0      0312        PULS  Y,PC        RETURN
               0313 *
106F 1F20      0314 NOBRK  TFR   Y,D
1071 B7FF46    0315        STA   HIADD       SET UP ADDRESS ON PIA
1074 F7FF44    0316        STB   LOWADD
1077 B6FF40    0317        LDA   DATARG      GET DATA
107A 81FF      0318        CMPA  #$FF        IS IT ERASED
107C 261C      0319        BNE   NOTMTY       NOT ERASED
107E 3121      0320        LEAY  1,Y         INCREASE
               0321 * ADJUST PROGRESS COUNTER IF NEEDED
1080 1F20      0322        TFR   Y,D
1082 5D        0323        TSTB              IF NOT ZERO CONTINUE
1083 2609      0324        BNE   DONEYT       DONE YET
1085 8403      0325        ANDA  #%00000011  SEEE IF THESE ARE ZERO
1087 2605      0326        BNE   DONEYT      NO SO SKIP
1089 CC8F8F    0327        LDD   #$8F8F      GREEN SQUARES
108C ED83      0328        STD   ,--X        DECREASE MONITOR FROM RIGHT
               0329 *
108E 108C2000  0330 DONEYT CMPY  #TOPADD+1   ADDRESS  LIMIT
```

```
1092 26CF       0331         BNE   VLOOP
1094 308D0079   0332         LEAX  GOOD,PCI    IS FULLY ERASED
1098 2019       0333         BRA   VEXIT
                0334 *
109A FC0088     0335 NOTMTY LDD   CURLOC
109D C30020     0336         ADDD  #32         MOVE TO NEXT LINE
10A0 FD0088     0337         STD   CURLOC
10A3 308D0059   0338         LEAX  ADDNMT,PCR  GET ADDRESS MESSAGE
10A7 1706B1     0339         LBSR  OUTST$
10AA 1F21       0340         TFR   Y,X
10AC 17071C     0341         LBSR  HEXOUT      PUT LAST ADDRESS UP
10AF 308D0058   0342         LEAX  BAD,PCR
10B3 1706A5     0343 VEXIT  LBSR  OUTST$
10B6 308D0063   0344         LEAX  VERFY,PCR
10BA 17069E     0345         LBSR  OUTST$
                0346 *
10BD 17064A     0347         LBSR  INSTR$      GET KEYBOARD RESPONSE
10C0 35A0       0348         PULS  Y,PC        RECOVER Y AND RETURN
                0349 *
10C2 20         0350 ERAMSG FCC   /   EPROM ERASURE VERIFICATION/
10C3 2020455052
10C8 4F4D204552
10CD 4153555245
10D2 2056455249
10D7 4649434154
10DC 494F4E
10DF 0D         0351         FCB   $0D         <CR>
10E0 20         0352         FCS   /   ==========================<0D><0D>/
10E1 20203D3D3D
10E6 3D3D3D3D3D
10EB 3D3D3D3D3D
10F0 3D3D3D3D3D
10F5 3D3D3D3D3D
10FA 3D3D3D0D0D
10FF 00
                0353 *
1100 0D         0354 ADDNMT FCS   /<0D><0D>ADDRESS /
1101 0D41444452
1106 4553532000
110B 20         0355 BAD    FCS   / NOT /
110C 4E4F542000
1111 0D         0356 GOOD   FCS   /<0D><0D>   FULLY /
1112 0D20202046
1117 554C4C5920
111C 00
111D 45         0357 VERFY  FCS   /ERASED<0D><0D>PRESS "ENTER" TO CONTINUE /
111E 5241534544
1123 0D0D505245
1128 5353202245
112D 4E54455222
1132 20544F2043
1137 4F4E54494E
113C 55452000
                0358 ********************************************
                0359 ****************************************
                0360 *      EPROM   PROGRAMMING              *
                0361 ****************************************
                0362 *
                0363 *
                0364 * THIS GETS START ADDRESS AND END ADDRESS IN
                0365 * RAM AND START TARGET ADDRESS IN EPROM
                0366 * CHECKS FOR ERRORS THEN TRANSFERS DATA
                0367 ****************************************
                0368 *
1140 BDA928     0369 COPY   JSR   CLEAR       SCREEN
1143 308D00CC   0370         LEAX  CPYTTL,PCR  GET HEADER
1147 170611     0371         LBSR  OUTST$      PUT IT UP
                0372 *
                0373 * GET START ADDRESS IF NULL THEN RETURN
114A 308D0171   0374         LEAX  STRTXT,PCR
114E 17066E     0375         LBSR  INPUT$
                0376 * DID WE GET A NULL
1151 B601DA     0377         LDA   BUFFER      GET FIRST BYTE
1154 810D       0378         CMPA  #$0D        IS IT CR?
1156 2601       0379         BNE   GETST
1158 39         0380 CEXIT  RTS
                0381 *
1159 170604     0382 GETST  LBSR  HEXINT      CONVERT INTO REG X
115C BF01D1     0383         STX   START       SET START ADDRESS
115F 5D         0384         TSTB              CHECK FOR ERRORS
1160 26DE       0385         BNE   COPY
                0386 *
1162 308D0170   0387         LEAX  ENDMSG,PCR  GET ENDING RAM ADDRESS
1166 170656     0388         LBSR  INPUT$      GET ENDING ADDRESS
1169 B601DA     0389         LDA   BUFFER      TEST FOR NULL
116C 810D       0390         CMPA  #$0D        IS IT CR?
116E 27E8       0391         BEQ   CEXIT
                0392 *
1170 1705ED     0393         LBSR  HEXINT      GET VALUE ENTERED
```

```
1173 5D         0394         TSTB              DID WE GET ERROR?
1174 26CA       0395         BNE   COPY        RESTART
                0396 * X NOW HAS ENDING
1176 1F10       0397         TFR   X,D         PUT INTO ACC D
1178 B301D1     0398         SUBD  START       FIND DIFFERENCE
117B 2542       0399         BLO   DERROR      DATA ERROR MESSAGE
117D C30001     0400         ADDD  #1          TO MAKE IT ACTUAL COUNT
1180 FD01D3     0401         STD   COUNT       SAVE IT
                0402 *
                0403 *NOW GET TARGET ADDRESS
1183 308D0166   0404         LEAX  TGTMSG,PCR
1187 170635     0405         LBSR  INPUT$
118A B601DA     0406         LDA   BUFFER      NULL ENTRY?
118D 810D       0407         CMPA  #$0D        <CR>
118F 27C7       0408         BEQ   CEXIT       SO EXIT ROUTINE
                0409 *
1191 1705CC     0410         LBSR  HEXINT      GET VALUE IN X
1194 5D         0411         TSTB              ERROR?
1195 26A9       0412         BNE   COPY        RESTART
                0413 *
                0414 * X NOW HAS START ADDRESS
1197 BF01D5     0415         STX   TARGET
119A 8C1FFF     0416         CMPX  #TOPADD     HIGHEST ALLOWED VALUE
119D 2229       0417         BHI   TOOHI        GO TO ERROR MESSAGE
119F 3410       0418         PSHS  X           PUT TARGET ONTO STACK
11A1 CC2000     0419         LDD   #NUMK*1024  EPROM SIZE
11A4 A3E1       0420         SUBD  ,S++        SUBTRACT TARGET & CLEAN STACK
                0421 * D NOW HAS AVAILABLE BYTES ABOVE TARGET
11A6 10B301D3   0422         CMPD  COUNT
11AA 2525       0423         BLO   NOROOM       NOT ENOUGH ROOM
                0424 * ALL SEEMS OK GO PROGRAM
                0425 * FIRST DISPLAY WORKING ADDRESS TEXT
11AC 308D01AC   0426         LEAX  WRKADD,PCR
11B0 1705A8     0427         LBSR  OUTST$
                0428 *
11B3 17FDB2     0429         LBSR  PROGRM
                0430 *
11B5 5D         0431         TSTB              FOR ERROR CODE
11B7 2729       0432         BEQ   GOODPR      GOOD PROGRAM
11B9 C101       0433         CMPB  #1          NOT ERASED
11BB 2741       0434         BEQ   UNERAS
11BD 204E       0435         BRA   BADLOC       BAD PROM LOCATION
                0436 ****************************************
                0437 **
                0438 *
11BF 308D0088   0439 DERROR LEAX  DIFF,PCR    START ABOVE END MSG
11C3 170595     0440         LBSR  OUTST$
11C6 2010       0441         BRA   .KEY
                0442 *
11C8 308D00A0   0443 TOOHI  LEAX  HIGH,PCR    TARGET TOO HIGH
11CC 17058C     0444         LBSR  OUTST$
11CF 2007       0445         BRA   .KEY
                0446 *
11D1 308D00B2   0447 NOROOM LEAX  NROOM,PCR   NOT ENOUGH ROOM IN EPROM
11D5 170583     0448         LBSR  OUTST$
                0449 *
11D8 308D00C7   0450 .KEY   LEAX  EKEY,PCR    WAIT FOR ENTER
11DC 1705E0     0451         LBSR  INPUT$
11DF 16FF5E     0452         LBRA  COPY
                0453 *
11E2 308D011E   0454 GOODPR LEAX  GOODP1,PCR  GOOD PROGRAM
11E6 170572     0455         LBSR  OUTST$
11E9 BE01D1     0456         LDX   START       GET LAST RAM ADDRESS
11EC 1705DC     0457         LBSR  HEXOUT      OUTPUT IT
11EF 308D012D   0458         LEAX  GOODP2,PCR
11F3 170565     0459         LBSR  OUTST$
11F6 BE01D5     0460         LDX   TARGET      GET LAST PROM ADDRESS
11F9 1705CF     0461         LBSR  HEXOUT      OUTPUT IT
11FC 20DA       0462         BRA   .KEY
                0463 *
11FE 308D0139   0464 UNERAS LEAX  UNERSD,PCR  NOT ERASED
1202 170556     0465 .LEAVE LBSR  OUTST$
1205 BE01D5     0466         LDX   TARGET      GET LAST EPROM ADDRESS
1208 1705C0     0467         LBSR  HEXOUT      OUTPUT IT
120B 20CB       0468         BRA   .KEY
                0469 *
120D 308D013B   0470 BADLOC LEAX  BADPRM,PCR   BAD PROM LOCATION
1211 20EF       0471         BRA   .LEAVE
                0472 *
                0473 *****
                0474 *
1213 20         0475 CPYTTL FCC   /     RAM TO EPROM TRANSFER/
1214 2020202052
1219 414D20544F
121E 204550524F
1223 4D20545241
1228 4E53464552
122D 0D         0476         FCS   /<0D>     =====================<0D><0D>/
122E 2020202020
1233 3D3D3D3D3D
```

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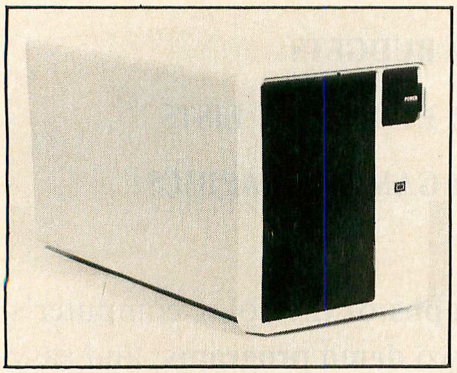

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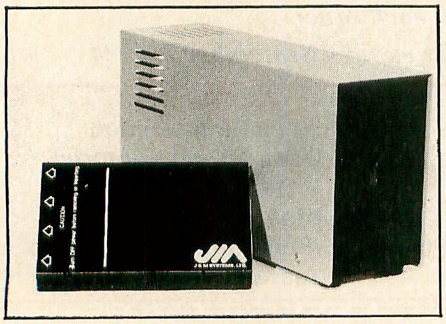

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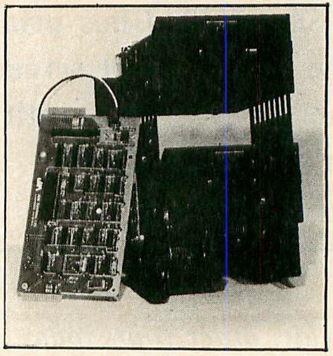

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```
1238 3D3D3D3D3D
123D 3D3D3D3D3D
1242 3D3D3D3D3D
1247 3D0D0D00
                0477 *
124B 0D         0478 DIFF   FCS   /(0D)(0D)START HIGHER THAN END ADDRESS(0D)/
124C 0D53544152
1251 5420484947
1256 4845522054
125B 48414E2045
1260 4E44204144
1265 4452455353
126A 0D00
126C 0D         0479 HIGH   FCS   /(0D)(0D)TARGET ADDRESS TOO HIGH(0D)/
126D 0D54415247
1272 4554204144
1277 4452455353
127C 20544F4F20
1281 484947480D
1286 00
1287 0D         0480 NROOM  FCS   /(0D)(0D)NOT ENOUGH ROOM IN EPROM(0D)/
1288 0D4E4F5420
128D 454E4F5547
1292 4820524F4F
1297 4D20494E20
129C 4550524F4D
12A1 0D00
12A3 0D         0481 EKEY   FCS   /(0D)PRESS "ENTER" TO CONTINUE /
12A4 5052455353
12A9 2022454E54
12AE 4552222054
12B3 4F20434F4E
12B8 54494E5545
12BD 2000
12BF 20         0482 STRTXT FCS   /   RAM START ADDRESS: /
12C0 202052414D
12C5 2053544152
12CA 5420414444
12CF 524553533A
12D4 2000
12D6 20         0483 ENDMSG FCS   /     RAM END ADDRESS: /
12D7 2020202052
12DC 414D20454E
12E1 4420414444
12E6 524553533A
12EB 2000
12ED 45         0484 TGTMSG FCS   /EPROM TARGET ADDRESS: /
12EE 50524F4D20
12F3 5441524745
12F8 5420414444
12FD 524553533A
1302 2000
1304 0D         0485 GOODP1 FCS   /(0D)(0D)  LAST RAM ADDRESS USED: /
1305 0D20204C41
130A 5354205241
130F 4D20414444
1314 5245535320
1319 555345443A
131E 2000
1320 0D         0486 GOODP2 FCS   /(0D)LAST EPROM ADDRESS USED: /
1321 4C41535420
1326 4550524F4D
132B 2041444452
1330 4553532055
1335 5345443A20
133A 00
133B 0D         0487 UNERSD FCS   /(0D)(0D)NOT ERASED AT /
133C 0D4E4F5420
1341 4552415345
1346 4420415420
134B 00
134C 0D         0488 BADPRM FCS   /(0D)(0D)BAD EPROM AT /
134D 0D42414420
1352 4550524F4D
1357 2041542000
135C 0D         0489 WRKADD FCS   /(0D)(0D)PROGRAMMING EPROM AT /
135D 0D50524F47
1362 52414D4D49
1367 4E47204550
136C 524F4D2041
1371 542000
                0490 ****************************************
                0491 ***********************************************
                0492 *   DUMPS EPROM CONTENTS TO SCREEN OR PRINTER *
```

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```
                0493 ****************************************************
                0494 *
1374 BDA928     0495 DUMP   JSR   CLEAR       SCREEN
1377 308D0121   0496        LEAX  DMPTTL,PCR  DUMP TITLE
137B 1703DD     0497        LBSR  OUTST$
                0498 *
137E 308D0148   0499        LEAX  DSTRT,PCR   GET START ADDRESS
1382 17043A     0500        LBSR  INPUT$
                0501 * DID WE GET A NULL?
1385 B601DA     0502        LDA   BUFFER
1388 810D       0503        CMPA  #$0D        <CR>
138A 2601       0504        BNE   DCONT        CONTINUE ROUTINE
                0505 *
138C 39         0506        RTS                RETURN TO MENU
                0507 *
138D 1703D0     0508 DCONT  LBSR  HEXINT      INTO X REG
1390 5D         0509        TSTB              AN ERROR
1391 26E1       0510        BNE   DUMP        RESTART IF SO
1393 8C1FFF     0511        CMPX  #TOPADD     CHECK RANGE
1396 22DC       0512        BHI   DUMP        RESTART IF OVER
1398 3410       0513        PSHS  X           PRESERVE START
                0514 *
139A 308D013C   0515        LEAX  ESTRT,PCR   GET END ADDRESS
139E 17041E     0516        LBSR  INPUT$
13A1 1703BC     0517        LBSR  HEXINT      INTO X REG
13A4 5D         0518        TSTB              FOR ERROR
13A5 2605       0519        BNE   RSTART      RESTART IF SO
                0520 * CHECK FOR OVER RANGE
13A7 8C1FFF     0521        CMPX  #TOPADD
13AA 2304       0522        BLS   GDUMP       RANGE OK
13AC 3262       0523 RSTART LEAS  2,S         CLEAN STACK
13AE 20C4       0524        BRA   DUMP        RESTART
13B0 1F10       0525 GDUMP  TFR   X,D         TO SEE IF START IS AFTER END
13B2 A3E4       0526        SUBD  ,S          START ON STACK
13B4 2BF6       0527        BMI   RSTART      NOT SO RESTART
                0528 *
13B6 3410       0529        PSHS  X           PRESERVE END ADDRESS
13B8 308D012E   0530        LEAX  DEV,PCR     WHICH DEVICE?
13BC 170400     0531        LBSR  INPUT$       S OR P
13BF B601DA     0532        LDA   BUFFER      GET FIRST LETTER
13C2 C604       0533        LDB   #4          FOR SCREEN DUMP WIDTH
13C4 8150       0534        CMPA  #'P         IS IT PRINTER?
13C6 2607       0535        BNE   SCR         NO SO LEAVE DEVNUM
13C8 86FE       0536        LDA   #-2         PRINTER DEVICE CODE
13CA B7006F     0537        STA   DEVNUM
13CD C610       0538        LDB   #16         FOR ITEM COUNT
13CF 3530       0539 SCR    PULS  X,Y         X HAS END, Y START
13D1 50         0540        NEGB              FOR MASK
13D2 3404       0541        PSHS  B           SAVE ON STACK
13D4 1F20       0542        TFR   Y,D         ROUND DOWN START
13D6 E4E4       0543        ANDB  ,S           ROUNDED DOWN NOW
13D8 1F02       0544        TFR   D,Y         PUT IT BACK IN Y
13DA 3410       0545        PSHS  X           SAVE END ON STACK
                0546 * SET LINE COUNT FOR SCREEN
13DC 8610       0547        LDA   #16         # OF LINES
13DE B701D3     0548        STA   COUNT
                0549 *
13E1 1F21       0550 DMLOOP TFR   Y,X         OUTPUT ADDRESS
13E3 3420       0551        PSHS  Y           SAVE Y
13E5 860D       0552        LDA   #$0D
13E7 AD9FA002   0553        JSR   [CHROUT]    START NEW LINE
13EB 1703DD     0554        LBSR  HEXOUT      OUTPUT ADDRESS
13EE 3520       0555        PULS  Y           RECOVER Y
13F0 C606       0556        LDB   #6          SPACES COUNT
13F2 17009B     0557        LBSR  SPACES      OUTPUT THEM
13F5 1F20       0558 INLOOP TFR   Y,D         GET START ADDRESS
13F7 B7FF46     0559        STA   HIADD
13FA F7FF44     0560        STB   LOWADD      SET UP EPROM ADDRESS
13FD 3121       0561        LEAY  1,Y         INCREMENT ADDRESS
                0562 **** OUTPUT THE HEX CHARACTERS
13FF F6FF40     0563        LDB   DATARG      GET FROM EPROM
1402 3420       0564        PSHS  Y           PRESERVE VALUE
1404 170398     0565        LBSR  HXPAIR      PUT IN BUFFER
1407 8E01DA     0566        LDX   #BUFFER     POINT TO IT
140A 17034E     0567        LBSR  OUTST$
140D 3520       0568        PULS  Y           RECOVER Y
140F C601       0569        LDB   #1
1411 8070       0570        BSR   SPACES
                0571 *
1413 1F20       0572        TFR   Y,D         RECOVER COUNT IN D
1415 6362       0573        COM   2.S         FOR LOOK AT LOWER BITS
1417 E462       0574        ANDB  2,S         COUNT MASK
1419 3401       0575        PSHS  CC          PRESERVE TEST RESULT
141B 6363       0576        COM   3,S         PUT IT BASK AS IT WAS
141D 3501       0577        PULS  CC          RECOVER TEST RESULT
141F 26D4       0578        BNE   INLOOP      NOT AT END OF LINE YET
                0579 *
                0580 *
1421 C602       0581        LDB   #2          SPACES
```

```
1423 8D6B       0582        BSR   SPACES      OUTPUT THEM
1425 E662       0583        LDB   2,S         GET COUNT AS NEG
                0584 * B NOW HAS -16 IN IT
1427 30A5       0585 CHLOOP LEAX  B,Y         GET FIRST ADDR. IN GROUP
1429 3404       0586        PSHS  B           SAVE COUNT
142B 1F10       0587        TFR   X,D         PUT IT TO EPROM
142D B7FF46     0588        STA   HIADD
1430 F7FF44     0589        STB   LOWADD
1433 3504       0590        PULS  B           RECOVER COUNT
1435 B6FF40     0591        LDA   DATARG      GET EPROM DATA
1438 8120       0592        CMPA  #32         HIGHER TO PRINT
143A 2509       0593        BLO   DOT         CHANGE TO DOT LESS THAN 3
143C 7D006F     0594        TST   DEVNUM      TO PRINTER?
143F 2706       0595        BEQ   OKPRNT      TO SCREEN SO OK
1441 8180       0596        CMPA  #$80        HIGHEST PRINTABLE?
1443 2502       0597        BLO   OKPRNT
1445 862E       0598 DOT    LDA   #'.         REPLACE WITH DOT
1447 AD9FA002   0599 OKPRNT JSR   [CHROUT]
144B 5C         0600        INCB
144C 2DD9       0601        BLT   CHLOOP      GOES ZERO WHEN DONE
                0602 ****
                0603 *ARE WE AT END YET?
144E 10ACE4     0604        CMPY  ,S          END ON STACK
1451 2228       0605        BHI   DMPXT       YES SO EXIT LOOP
                0606 *
1453 7D006F     0607        TST   DEVNUM      TO PRINTER?
1456 270B       0608        BEQ   NXLINE      DELETE SCREEN LINE COUNT
1458 AD9FA000   0609        JSR   [POLCAT]    BREAK PRESSED?
145C 8103       0610        CMPA  #3          BREAK
145E 271B       0611        BEQ   DMPXT       EXIT ROUTINE
1460 16FF7E     0612        LBRA  DMLOOP      CONTINUE OUTPUT
                0613 *
1463 7A01D3     0614 NXLINE DEC   COUNT       LINE COUNTER
1466 1026FF77   0615        LBNE  DMLOOP      NOT DONE YET
146A 8610       0616        LDA   #16         RESE LINE COUNT
146C B701D3     0617        STA   COUNT
146F AD9FA000   0618 DWAIT  JSR   [POLCAT]    WAIT FOR KEY
1473 27FA       0619        BEQ   DWAIT       NO KEY YET
1475 8103       0620        CMPA  #3          IS IT BREAK
1477 1026FF66   0621        LBNE  DMLOOF      NOSO CONTINUE
                0622 *
147B 3263       0623 DMPXT  LEAS  3,S         CLEAN STACK
```

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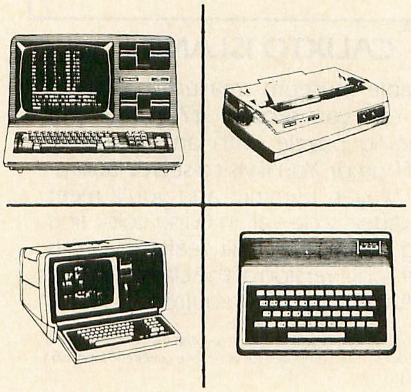

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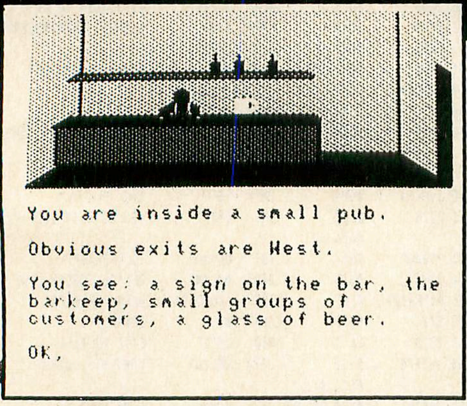
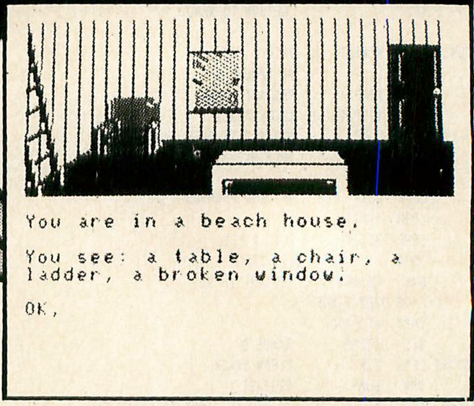


```
You are inside a small pub.

Obvious exits are West.

You see: a sign on the bar, the
barkeep, small groups of
customers, a glass of beer.

OK,
```

SHENANIGANS

Countless legends tell of a magnificent Pot of Gold hidden at the end of the rainbow. Many have attempted to find the marvelous treasure but success has eluded them and it remains hidden to this day. You, as a dedicated adventurer, have determined to search for the fabled gold and succeed where others have failed. This one is great fun! 32K required.

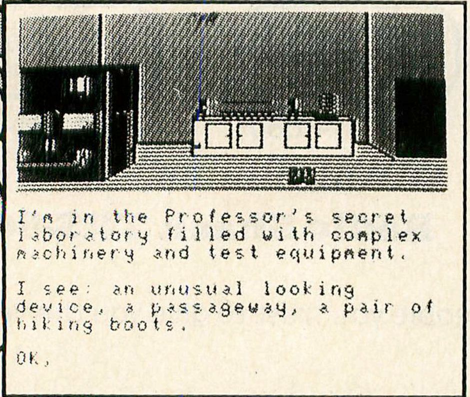


```
You are in a beach house.

You see: a table, a chair, a
ladder, a broken window.

OK,
```

SEA SEARCH

Get your shark repellant and scuba tanks ready! The graphics in this adventure are truly outstanding and the under water scenes are unforgettable. You'll run into a pirate, a mermaid and some hungry sharks in this colorful and unique treasure hunt. 32K required.

Hot CoCo—April, '84. "The fine graphics accent your imagination..."

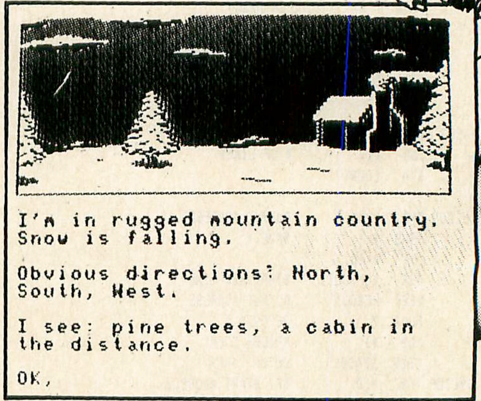


```
I'm in the Professor's secret
laboratory filled with complex
machinery and test equipment.

I see: an unusual looking
device, a passageway, a pair of
hiking boots.

OK,
```

CALIXTO ISLAND

A valuable museum treasure has been stolen, can you recover it??? This is a challenging puzzle with an occasional twist of humor. You'll visit a secret laboratory, a Mayan pyramid and you'll meet crazy Trader Jack—all in living color and exciting detail. You will really love this hi-res graphic version of the classic Calixto Island Adventure. 32K required.

Rainbow—April, '84. "It was enough to keep my wife and 8 year old son glued to the computer for an entire weekend and two week nights..."



```
I'm in rugged mountain country.
Snow is falling.

Obvious directions: North,
South, West.

I see: pine trees, a cabin in
the distance.

OK,
```

BLACK SANCTUM

Encounter the forces of black magic as you roam around an old 18th century monastery. You'll see all the evil locations in this spooky adventure, you'll love searching out and destroying the evil in this classic tale. A MUST for every adventure game fan! 32K required.

Rainbow—May, '84—"It's the graphic screens that are the shining stars..." "Some of the best I've seen."

MD

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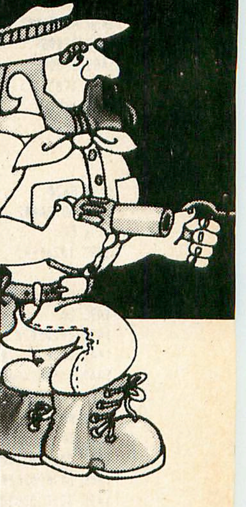
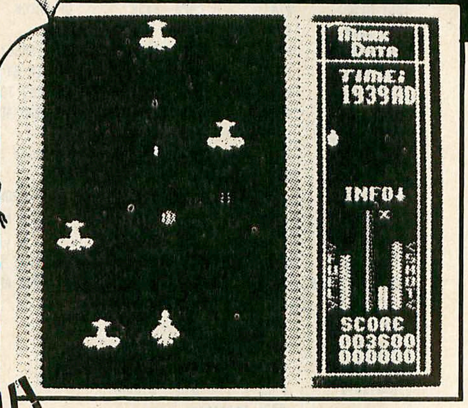


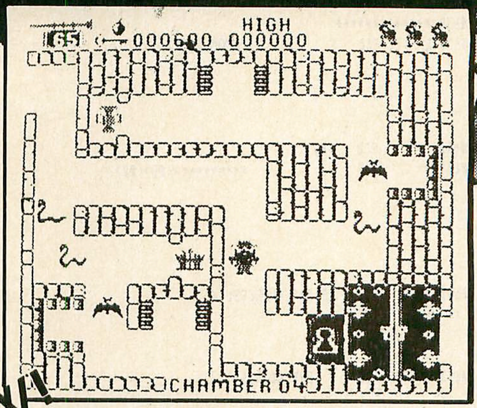


NEW!

TIME FIGHTER

Pilot your MD-64 fighter through a hazardous time tunnel. Your mission is to destroy the dreaded Time Guardian who threatens the natural order of the universe. In order to reach this menace you must fight aerial dangers from strange and different time zones. If you like fast action, this one's for you! 16K required.

Rainbow—March, '84. "One of the best in your library of computer games. . .It is a real gem."

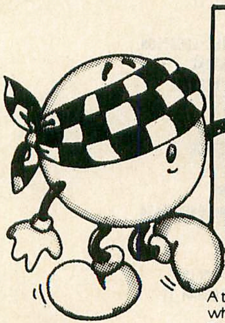


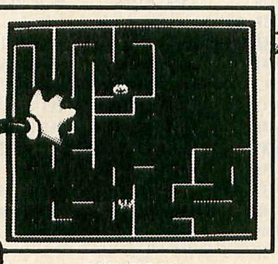
NEW!

TUT'S TOMB

Explore the ancient, mystical tomb of the great Pharoah. Find the magical keys which lead you to unbelievable treasures as you out maneuver the creatures that slither and swarm about you. Super fast arcade action—this one will knock your socks off with 16 screens of incredible color and sound. Fabulous! 32K required.

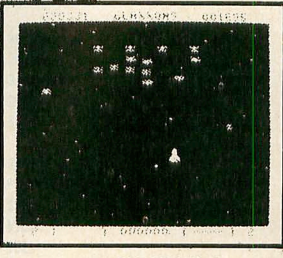
Hot CoCo—April, '84. "State-of-the-art CoCo graphics. . A first rate game."





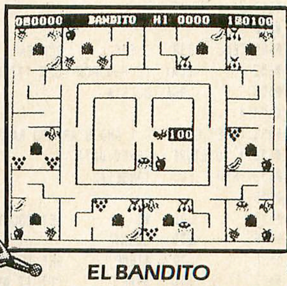
BUMPERS

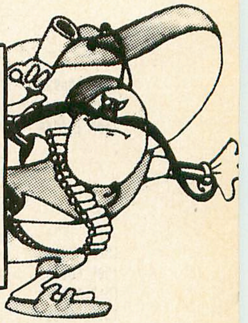
A truly great maze game. Especially exciting when two players compete simultaneously. Tension mounts as you wildly race through a hidden obstacle course. Barrier walls are invisible until you bump into them and you must proceed cautiously as each dead end has a hidden booby trap. 16K required.



GLAXXONS

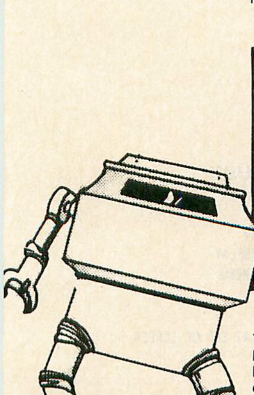
Pit your playing skill against squadrons of swooping, diving spacecraft. Fast and furious with seven selectable skill levels and automatic game acceleration. . .guaranteed to blister your joystick finger. The object of the game is to achieve the highest score by eliminating as many attacking spacecraft as possible while avoiding your own destruction. Dynamite! 16K required.

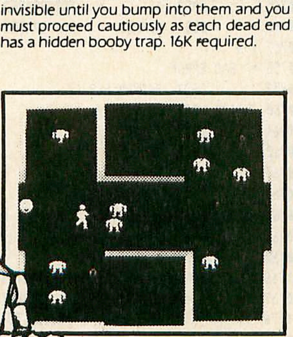




EL BANDITO

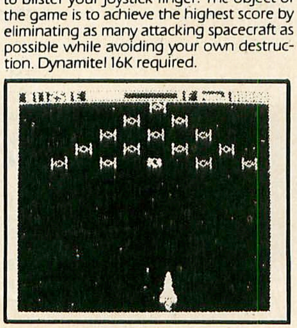
El Bandito has to be a crafty little hombre to stay alive as he loots the local countryside. Escape into a tunnel to avoid that angry spider. . .race around the corner towards your lair. Two players may compete simultaneously in this unusual game. Selectable skill levels provide a challenge for beginners as well as experts. 16K required.





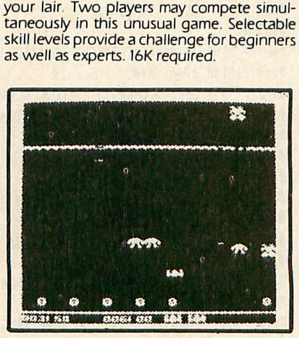
HAYWIRE

The best Color Computer version of the Berzerk arcade game you can get. . .A real hi-res classic! This challenging combination of angry robots and the evil menace will provide many hours of fun and excitement. Haywire combines joystick and fire button action and is great as a two player game. 16K required.



ASTRO BLAST

Wave after wave of alien attackers—each one different and unique. A great space "shoot-em-up" with hi-res graphics, lots of color and dramatic sound effects. Three selectable skill levels coupled with automatic game acceleration provide a challenge for novice and expert alike. One of our all time best sellers! 16K required.



COSMIC CLONES

Clonial Warriors, Super Klones, Double Bombs and "the Death Layer" relentlessly challenge the most skillful player in this unique, fast action game. Your goal is to achieve the highest score by eliminating the Clonial invasion forces thus protecting your starbase fuel cells. Fast Fun! One of our favorites. 16K required.

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```
147D 860D       0624        LDA   #$0D        CR AT END
147F AD9FA002   0625        JSR   [CHROUT]    ALSO CLRS BUFFER IN PRINTER
1483 7F006F     0626        CLR   DEVNUM      RESET TO SCREEN
1486 308DFE19   0627        LEAX  EKEY.PCR    ENTER MESSAGE
148A 170332     0628        LBSR  INPUT$
148D 16FEE4     0629        LBRA  DUMP        RESTART
                0630 ****
                0631 **************
                0632 * OUTPUT SPACES BY COUNT IN B
1490 8620       0633 SPACES LDA   #32         SPACE
1492 AD9FA002   0634 OLOOP  JSR   [CHROUT]
1496 5A         0635        DECB               COUNT
1497 1026FFF7   0636        LBNE  OLOOP
149B 39         0637        RTS
                0638 *************
149C 20         0639 DMPTTL FCC   /           EPROM DUMP/
149D 2020202020
14A2 2020202020
14A7 4550524F4D
14AC 2044554D50
14B1 0D         0640        FCB   $0D
14B2 20         0641        FCS   /           ==========<0D><0D>/
14B3 2020202020
14B8 2020202020
14BD 3D3D3D3D3D
14C2 3D3D3D3D3D
14C7 0D0D00
14CA 53         0642 DSTRT  FCS   /START ADDRESS: /
14CB 5441525420
14D0 4144445245
14D5 53533A2000
14DA 20         0643 ESTRT  FCS   / END ADDRESS: /
14DB 20454E4420
14E0 4144445245
14E5 53533A2000
14EA 28         0644 DEV    FCS   /(P)rinter or (S)creen? /
14EB 502972696E
14F0 746572206F
14F5 7220285329
14FA 637265656E
14FF 3F2000
                0645 ********************************************
                0646 ****************************************
                0647 * INSPECTS AND PROGRAMS INDIVIDUAL CELL *
                0648 ****************************************
                0549 *
                0650 *
1502 BDA928     0651 CELL   JSR   CLEAR       SCREEN
1505 308D00F7   0652        LEAX  CELMSG.PCR  GET TITLE
1509 17024F     0653        LBSR  OUTST$
                0654 *
                0655 * SET COUNT TO 1 AND START TO RAM LOCATION
                0656 * TO STORE ENTERED DATA
01D7            0657 TEMP   EQU   TARGET+2
                0658 *
150C CC0001     0659        LDD   #1          SET COUNT
150F FD01D3     0660        STD   COUNT
1512 CC01D7     0661        LDD   #TEMP       GET TEMPORARY ADDRESS
1515 FD01D1     0662        STD   START       PUT IT AS START
                0663 *
                0664 * CLEAR TARGET TO ZERO
1518 7F01D5     0665        CLR   TARGET
151B 7F01D6     0666        CLR   TARGET+1
                0667 *
                0668 * DISPLAY DATA AT TARGET LOCATION
151E 860D       0669 DISDAT LDA   #$0D        CR
1520 AD9FA002   0670        JSR   [CHROUT]    MOVE DOWN A LINE
1524 FC01D5     0671        LDD   TARGET      GET EPROM ADDRESS
1527 B7FF46     0672        STA   HIADD
152A F7FF44     0673        STB   LOWADD
                0674 *
152D 1F01       0675        TFR   D,X         DISPLAY ADDRESS
152F 170299     0676        LBSR  HEXOUT
1532 1700BB     0677        LBSR  MOVCRS      PLACE TO RIGHT
                0678 *
1535 F6FF40     0679        LDB   DATARG      GET EPROM DATA
                0680 *
1538 3404       0681        PSHS  B           SAVE VALUE
153A 170262     0682        LBSR  HXPAIR      MAKE IT A HEX STRING
153D 8E01DA     0683        LDX   #BUFFER
1540 170218     0684        LBSR  OUTST$      OUTPUT CONTENTS
                0685 *
1543 1700AA     0686        LBSR  MOVCRS      MAKE A SPACE
1546 3502       0687        PULS  A           RECOVER CHARACTER IN A
1548 8120       0688        CMPA  #32         LOWEST PRINTABLE CHARACTER
154A 2202       0689        BHI   CHARCT      OUTPUT AS A CHARACTER
154C 862E       0690        LDA   #'.          REPLACE BY A DOT
154E AD9FA002   0691 CHARCT JSR   [CHROUT]
1552 17009B     0592        LBSR  MOVCRS      OVER A PLACE
1555 863F       0693        LDA   #'?         PROMPT
1557 AD9FA002   0694        JSR   [CHROUT]    DISPLAY IT
                0695 *
155B AD9FA000   0696 GTKEY  JSR   [POLCAT]    GET RESPONSE
155F 27FA       0697        BEQ   GTKEY       WAIT FOR KEY
                0698 *
                0699 * VALID RESPONSES ARE:
                0700 * ^ PREVIOUS ADDRESS (WRAPS AROUND)
                0701 * DOWN ARROW NEXT ADDRESS DITTO
                0702 * N ENTER NEW ADDRESS
                0703 * P PROGRAM THIS ADDRESS
                0704 * X EXIT TO MENU
                0705 *************************************
                0706 *
1561 815E       0707        CMPA  #$5E        UP ARROW
1563 2610       0708        BNE   .DARROW
1565 FC01D5     0709        LDD   TARGET      GET TARGET VALUE
1568 830001     0710        SUBD  #1          REDUCE BY ONE
156B 2A03       0711        BPL   NOTNEG      NO NEED TO WRAP
156D CC1FFF     0712        LDD   #TOPADD     TO WRAP ADDRESS
1570 FD01D5     0713 NOTNEG STD   TARGET
1573 20A9       0714        BRA   DISDAT       DISPLAY IT
                0715 *******
1575 810A       0716 .DARROW CMPA #$0A        DOWN ARROW
1577 2613       0717        BNE   NEWADD      GET NEW ADDRESS FOR TARGET
1579 FC01D5     0718        LDD   TARGET
157C C30001     0719        ADDD  #1          INCREASE IT
157F 10832000   0720        CMPD  #NUMK*1024  WRAPPED AROUND?
1583 2602       0721        BNE   NTOVER
1585 4F         0722        CLRA
1586 5F         0723        CLRB
1587 FD01D5     0724 NTOVER STD   TARGET
158A 2092       0725        BRA   DISDAT
                0726 *******
158C 814E       0727 NEWADD CMPA  #'N         ENTER A NEW ADDRESS
158E 261A       0728        BNE   NEWDAT
1590 308D00AC   0729 TOOHIG LEAX  NADDRS,PCR  GET NEW ADDRESS MESSAGE
1594 170228     0730        LBSR  INPUT$      GET NEW VALUE
1597 1701C6     0731        LBSR  HEXINT      GET VALUE IN X
                0732 *  CHECK B FOR ERROR CODE B<>0 FOR ERROR
159A 5D         0733        TSTB
159B 1026FF7F   0734        LBNE  DISDAT      BAD SO DO NOTHING
159F 8C1FFF     0735        CMPX  #TOPADD     MUST NOT BE HIGHER THAN THIS
15A2 22EC       0736        BHI   TOOHIG
15A4 BF01D5     0737        STX   TARGET
15A7 16FF74     0738        LBRA  DISDAT      GO DISPLAY IT
                0739 ******
15AA 8150       0740 NEWDAT CMPA  #'P         PROGRAM THE LOCATION
15AC 263B       0741        BNE   DEXIT        EXIT ROUTINE
15AE 308D009D   0742 TOBIG  LEAX  NDATA,PCR   HEW DATA MESSAGE
15B2 17020A     0743        LBSR  INPUT$      GET DATA
15B5 1701A8     0744        LBSR  HEXINT      GET VALUE IN X
                0745 * TEST B FOR ERROR CODE B<>0 FOR ERROR
15B8 5D         0746        TSTB
15B9 1026FF61   0747        LBNE  DISDAT      DO NOTHING
15BD 8C00FF     0748        CMPX  #$FF        HIGHEST ALLOWED DATA
15C0 22EC       0749        BHI   TOBIG
15C2 1F10       0750        TFR   X,D
15C4 F701D7     0751        STB   TEMP        FOR PROGRAMMING
15C7 17F99E     0752        LBSR  PROGRM      TRY TO PROGRAM IT
15CA 5D         0753        TSTB
15CB 1027FF4F   0754        LBEQ  DISDAT      ALL OK
15CF C101       0755        CMPB  #1          NOT ERASED
15D1 2710       0756        BEQ   NOERSD      NOT ERASED
                0757 ***
                0758 *  BAD EPROM
15D3 308DFD75   0759        LEAX  BADPRM,PCR
15D7 170181     0760 .WRITE LBSR  OUTST$
15DA BE01D5     0761        LDX   TARGET
15DD 1701EB     0762        LBSR  HEXOUT
15E0 16FF3B     0763        LBRA  DISDAT
                0764 *
15E3 308DFD54   0765 NOERSD LEAX  UNERSD,PCR  UNERASED MESSAGE
15E7 20EE       0766        BRA   .WRITE
                0767 *********
15E9 8158       0768 DEXIT  CMPA  #'X         IS IT EXIT?
15EB 1026FF2F   0769        LBNE  DISDAT      NO SO REDISPLAY
15EF 39         0770        RTS               RETURN TO MENU
                0771 *********
                0772 *******
                0773 * THIS MOVES CURSOR 1 RIGHT IF NOT AT END OF SCREEN
15F0 FC0088     0774 MOVCRS LDD   CURLOC
15F3 108305FF   0775        CMPD  #$5FF       AT END?
15F7 2706       0776        BEQ   ATEND
15F9 C30001     0777        ADDD  #1          MAKE A SPACE
15FC FD0088     0778        STD   CURLOC
15FF 39         0779 ATEND  RTS
                0780 ****************************************
1600 20         0781 CELMSG FCC   /   INDIVIDUAL CELL PROGRAMMING/
```

```
1601 2020494E44
1606 4956494455
160B 414C204345
1610 4C4C205052
1615 4F4752414D
161A 4D494E47
161E 0D          0782         FCB   $0D
161F 20          0783         FCS   /   ===========================<0D><0D>/
1620 20203D3D3D
1625 3D3D3D3D3D
162A 3D3D3D3D3D
162F 3D3D3D3D3D
1634 3D3D3D3D3D
1639 3D3D3D3D0D
163E 0D00
1640 0D          0784 NADDRS FCS   /<0D>NEW ADDRESS? /
1641 4E45572041
1646 4444524553
164B 533F2000
164F 0D          0785 NDATA  FCS   /<0D>NEW DATA? /
1650 4E45572044
1655 4154413F20
165A 00
                 0786 ********************************************
                 0787 *   RETURNS CASSETTE FILE DATA
                 0788 ********************************************
                 0789 *
                 0790 * THIS RETURNS THE ADDRESSES OF THE LAST CLOADM
                 0791 *
                 0792 *
01E7             0793 STADD  EQU   487          START ADDRESS
007E             0794 ENDADD EQU   126          END ADDRESS
01E5             0795 EXECAD EQU   485          EXEC ADDRESS
                 0796 *
165B BDA928      0797 CFILE  JSR   CLEAR        SCREEN
165E 308D0035    0798        LEAX  FILMSG,PCR   HEADING
1662 1700F6      0799        LBSR  OUTST$
1665 BE01E7      0800        LDX   STADD        GET START ADDRESS
1668 170160      0801        LBSR  HEXOUT       OUTPUT IT
                 0802 *
166B 308D0071    0803        LEAX  ENDTXT,PCR  GET END MESSAGE
166F 1700E9      0804        LBSR  OUTST$
1672 9E7E        0805        LDX   ENDADD
1674 301F        0806        LEAX  -1,X         MOVE TO ACTUAL END
1676 170152      0807        LBSR  HEXOUT
                 0808 *
1679 308D0078    0809        LEAX  EXEMSG,PCR  GET EXE MESSAGE
167D 1700DB      0810        LBSR  OUTST$
1680 BE01E5      0811        LDX   EXECAD
1683 170145      0812        LBSR  HEXOUT
                 0813 *
                 0814 * MOVE CURSOR DOWN 2 LINES
1686 FC0088      0815        LDD   CURLOC
1689 C30020      0816        ADDD  #32
168C FD0088      0817        STD   CURLOC
                 0818 *
168F 308DFC10    0819        LEAX  EKEY,PCR     GET ENTER MESSAGE
1693 170129      0820        LBSR  INPUT$
                 0821 *
1696 39          0822        RTS
                 0823 *********************************************
1697 20          0824 FILMSG FCC   /      CASSETTE FILE DATA/
1698 2020202020
169D 2043415353
16A2 4554544520
16A7 46494C4520
16AC 44415441
16B0 0D          0825        FCB   $0D
16B1 20          0826        FCC   /       ==================/
16B2 2020202020
16B7 203D3D3D3D
16BC 3D3D3D3D3D
16C1 3D3D3D3D3D
16C6 3D3D3D3D
16CA 0D0D        0827        FDB   $0D0D
16CC 20          0828        FCS   /   START ADDRESS: /
16CD 2020205354
16D2 4152542041
16D7 4444524553
16DC 533A2000
16E0 0D          0829 ENDTXT FCS   /<0D>      END ADDRESS: /
16E1 2020202020
16E6 20454E4420
16EB 4144445245
16F0 53533A2000
16F5 0D          0830 EXEMSG FCS   /<0D>  EXECUTE ADDRESS: /
16F6 2020455845
16FB 4355544520
1700 4144445245
1705 53533A2000
```

```
               0831 ********************************************
               0832 ********************************************
               0833 *     U T I L I T Y    L I B R A R Y      *
               0834 ********************************************
               0835 ********************************************
               0836 *INSTR$ GETS A STRING FROM KEYBOARD AND PUTS*
               0837 *IT INTO "BUFFER" TERMINATED BY A ZERO BYTE.*
               0838 ********************************************
               0839 * BASIC POINTERS
0088           0840 CURLOC SET   $88          CURSOR LOCATION
A000           0841 POLCAT SET   $A000        KEYBOARD POLL
A002           0842 CHROUT SET   $A002        CHARACTER OUTPUT
006F           0843 DEVNUM SET   $6F          0 FOR SCREEN, -2 FOR PRINTER
               0844 ********************************************
               0845
170A 108E01DA  0846 INSTR$ LDY   #BUFFER      POINT Y TO BUFFER START
170E 8D40      0847 CRSR   BSR   CURSOR       PUT BLACK SQUARE UP
1710 AD9FA000  0848 GETKEY JSR   [POLCAT]     LOOK FOR KEY
1714 27FA      0849        BEQ   GETKEY       NOTHING ENTERED YET
1716 8108      0850        CMPA  #$8          BACKSPACE
1718 2617      0851        BNE   CHKRET
171A 108C01DA  0852        CMPY  #BUFFER      AT START OF BUFFER
171E 27EE      0853        BEQ   CRSR         NO BACKSPACE POSSIBLE
1720 8660      0854        LDA   #$60         BLANK
1722 A79F0088  0855        STA   [CURLOC]     STORE AT CURRENT LOCATION
1726 313F      0856        LEAY  -1,Y         DECREASE CURSOR LOCATION
1728 DC88      0857        LDD   CURLOC       GET CURSOR LOCATION
172A 830001    0858        SUBD  #1           REDUCE D BY ONE
172D DD88      0859        STD   CURLOC       RESET CURSOR LOCATION
172F 20DD      0860        BRA   CRSR
               0861 *
               0862 * IF CR THEN PUT INTO BUFFER, WITH A ZERO BYTE
               0863 * THEN EXIT
1731 8101      0864 CHKRET CMPA  #$0D         CARRIAGE RETURN
1733 2609      0865        BNE   INKEY        NO SO PUT INTO BUFFER
1735 A7A0      0866        STA   ,Y+          PUT CR INTO BUFFER
1737 AD9FA002  0867        JSR   [CHROUT]     PUT RETURN ON SCREEN
173B 6FA4      0868 .EXIT  CLR   Y            SET LAST BYTE TO ZERO
173D 39        0869        RTS
               0870 *
               0871 * PUT CHARACTER INTO BUFFER, CHECK FOR
               0872 * SPACE FIRST. IF BUFFER HAS 254 PUT IT
               0873 * THEN SET 256 BYTE TO ZERO AND EXIT
               0874 *
173E 8120      0875 INKEY  CMPA  #32          FIRST PRINTABLE CHARACTER
1740 25CC      0876        BLO   CRSR         NOT PRINTABLE SO LOOP
1742 A7A0      0877        STA   ,Y+          PQ  INTO BUFFER
1744 AD9FA002  0878        JSR   [CHROUT]     OUTPUT ENTERED CHARACTER
1748 108C02D8  0879        CMPY  #BUFFER+254 BUFFER FULL?
174C 25C0      0880        BLO   CRSR            NOT FULL
174E 20EB      0881        BRA   .EXIT
               0882 *
               0883 * CURSOR ROUTINE
1750 8680      0884 CURSOR LDA   #128         BLACK SQUARE
1752 A79F0088  0885        STA   [CURLOC]
1756 39        0886        RTS
               0887
               0888 ********************************************
               0889 ********************************************
               0890 *OUTST$ TAKES A STRING POINTED TO BY REG X  *
               0891 *AND PUTS IT TO OUTPUT DEVICE.  TERMINATED  *
               0892 *BY A ZERO BYTE IN BUFFER                   *
               0893 ********************************************
               0894 *   BASIC POINTER
A002           0895 CHROUT SET   $A002        OUTPUT ROUTINE
               0896 *
1757 AD9FA002  0897 .DSPLY JSR   [CHROUT]     OUTPUT CHARACTER
175B A680      0898 OUTST$ LDA   ,X+          GET CHARACTER
175D 26F8      0899        BNE   .DSPLY       DISPLAY IF NOT ZERO
175F 39        0900        RTS
               0901 ********************************************
               0902 ********************************************
               0903 *HEXINT GETS A HEX NUMBER FROM BUFFER AND   *
               0904 *PUTS IT IN REG X.  REG B IS ZERO IF NO     *
               0905 *ERROR.  WILL GET FIRST 4 CHARACTERS IN     *
               0906 *BUFFER OR TO <CR> OR ZERO BYTE             *
               0907 ********************************************
               0908
1760 108E01DA  0909 HEXINT LDY   #BUFFER      POINT Y TO BUFFER
1764 8E0000    0910        LDX   #0           CLEAR X FOR NUMBER
1767 8604      0911        LDA   #4           CHARACTER COUNTER
1769 E6A0      0912 GTHEX  LDB   ,Y+          GET CHARACTER FROM BUFFER
176B 271E      0913        BEQ   HEXIT        AT END OF BUFFER
176D C10D      0914        CMPB  #$0D         IS IT A <CR>?
176F 271A      0915        BEQ   HEXIT        YES SO AT END
1771 C130      0916        CMPB  #'0          IS IT LESS THAN 0?
1773 2524      0917        BLO   HEXERR       NO SO ERROR
1775 C139      0918        CMPB  #'9          GREATER THAN 9
1777 2214      0919        BHI   ALPHA        MAY BE A - F
1779 C030      0920        SUBB  #'0          MAKE A NUMBER
```

```
                0921 *
                0922 *B NOW HAS VALUE ENTERED
177B 1E01       0923 HEX    EXG   D,X         SWAP REGISTERS FOR SHIFT
                0924 * SHIFT D LEFT 4 PLACES
0004            0925        RPT   4
                0926        ASLB
                0927        ROLA
                0928        ENDR
177D 58            +        ASLB
177E 49            +        ROLA
177F 58            +        ASLB
1780 49            +        ROLA
1781 58            +        ASLB
1782 49            +        ROLA
1783 58            +        ASLB
1784 49            +        ROLA
1785 1E01       0929        EXG   D,X         PUT IT BACK INTO X
1787 3A         0930        ABX               ADD VALUE INTO REGISTER X
1788 4A         0931        DECA
1789 26DE       0932        BNE   GTHEX
178B 5F         0933 HEXIT  CLRB
178C 39         0934        RTS
                0935 **
178D C141       0936 ALPHA  CMPB  #'A          LESS THAN "A"
178F 2508       0937        BLO   HEXERR      YES SO ERROR
1791 C146       0938        CMPB  #'F         HIGHER THAN "F"
1793 2204       0939        BHI   HEXERR      YES SO ERROR
1795 C037       0940        SUBB  #'A-10       SET TO VALUE
1797 20E2       0941        BRA   HEX
                0942 **
1799 C601       0943 HEXERR LDB   #1
179B 8E0000     0944        LDX   #0
179E 39         0945        RTS
                0946 ********************************************
                0947 ********************************************
                0948 * HXPAIR CONVERTS CONTENTS OF REG B INTO A  *
                0949 * STRING IN BUFFER TERMINATED BY A ZERO     *
                0950 * BYTE.  NO <CR> IS ADDED TO THE STRING     *
                0951 ********************************************
                0952
                0953 *

179F 108E01DA   0954 HXPAIR LDY   #BUFFER     POINT TO BUFFER
                0955 * GET HIGH NIBBLE FROM B
17A3 1F98       0956        TFR   B,A          INTO A
0004            0957        RPT   4            MOVE DOWN 4 PLACES
                0958        LSRA
                0959        ENDR
17A5 44            +        LSRA
17A6 44            +        LSRA
17A7 44            +        LSRA

17A8 44            +        LSRA
                0960 *
17A9 8D09       0961        BSR   HEXASC
17AB 1F98       0962        TFR   B,A         GET LOW NIBBLE
17AD 840F       0963        ANDA  #$0F        GET LOW 4 BITS
17AF 8D03       0964        BSR   HEXASC      CONVERT AND STORE
17B1 6FA4       0965        CLR   Y           SET NEXT BUFFER LOCN TO 0
17B3 39         0966        RTS
                0967 *
                0968 *
                0969 * HEX TO ASCII CONVERSION ROUTINE
17B4 8109       0970 HEXASC CMPA  #9          IS DATA 9 OF LESS?
17B6 2302       0971        BLS   ASCZ
17B8 8B07       0972        ADDA  #'A-'9-1    NO,ADD OFFSET FOR LETTERS
17BA 8B30       0973 ASCZ   ADDA  #'0         CONVERT DATA TO ASCII
17BC A7A0       0974        STA   ,Y+         PUT INTO BUFFER
17BE 39         0975        RTS
                0976 *
                0977 ********************************************
                0978 ********************************************
                0979 * INPUT$ OUTPUTS A STRING POINTED TO BY REG *
                0980 * X, THEN RECEIVES A STRING FROM KEYBOARD   *
                0981 * AND PUTS IT INTO "BUFFER" TERMINATED WITH *
                0982 * A ZERO.  IF X IS ZERO NO STRING IS OUTPUT.*
                0983 * MAX. CHARACTERS IN BUFFER IS 255.         *
                0984 ********************************************
                0985 * BASIC POINTERS
0088            0986 CURLOC SET   $88         CURSOR LOCATION
A000            0987 POLCAT SET   $A000       KEYBOARD POLL
A002            0988 CHROUT SET   $A002       CHARACTER OUTPUT
006F            0989 DEVNUM SET   $6F         0 FOR SCREEN, -2 FOR PRINTER
                0990 ********************************************
```

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```
                0991 *
                0992 *
17BF 8C0000     0993 INPUT$ CMPX  #0            ANY TEXT TO OUTPUT
17C2 2703       0994        BEQ   NOTEXT
17C4 17FF94     0995        LBSR  OUTST$        OUTPUT TEXT STRING
17C7 17FF40     0996 NOTEXT LBSR  INSTR$        GET INPUT STRING
17CA 39         0997        RTS
                0998 *
                0999 *
                1000 *
                1001 ****************************************
                1002 ****************************************
                1003 * HEXOUT TAKES CONTENTS OF X AND PUTS IT ON *
                1004 * SCREEN.  USES HXPAIR TO DO IT IN 2 PARTS  *
                1005 * OUTST$ IS ALSO USED                      *
                1006 ****************************************
                1007
17CB 1F10       1008 HEXOUT TFR   X,D           PUT DATA INTO REG D
17CD 1E89       1009        EXG   A,B           PUT HIGH BYTE IN B
17CF 17FFCD     1010        LBSR  HXPAIR        PUT INTO SCREEN
17D2 3410       1011        PSHS  X             PRESERVE VALUE
17D4 8E01DA     1012        LDX   #BUFFER       POINT TO START OF STRING
17D7 17FF81     1013        LBSR  OUTST$        PUT OUT THE STRING
17DA 3506       1014        PULS  D             RECOVER VALUE IN D
17DC 17FFC0     1015        LBSR  HXPAIR        PUT LOW BYTE ON SCREEN
17DF 8E01DA     1016        LDX   #BUFFER       POINT TO START OF STRING
17E2 17FF76     1017        LBSR  OUTST$        PUT OUT THE STRING
---

EPROM.MAC                     COMPUTERWARE MACRO ASSEMBLER  PAGE 22
2764 EPROM PROGRAMMER By C.J.STEARMAN (C)1984

17E5 39         1018        RTS
                1019 *
                1020 ****************************************
                1021 *
                1022        TTL   2764 EPROM PROGRAMMER By C.J.STEARMAN (C)1984
                1023        NAM   EPROM.MAC
                1024 *
0E00            1025        END   EPROM
       NO ERROR(S) DETECTED


   SYMBOL TABLE:

 .BASIC 0E45    .CELL  0E33    .COPY  0E21    .DARRO 1575
 .DSPLY 1757    .DUMP  0E2A    .EXIT  173B    .FILE  0E3C
 .KEY   11D8    .LEAVE 1202    .WRITE 15D7    ADDNMT 1100
 ALPHA  178D    ASCZ   17BA    ATEND  15FF    BAD    110F
 BADLOC 120D    BADPRM 134C    BUFFER 01DA    CELL   1502
 CELMSG 1600    CEXIT  1158    CFILE  165B    CHARCT 154E
 CHKRET 1731    CHLOOP 1427    CHROUT A002    CLEAR  A928
 CLINES FF42    CLRREG 0F62    CONREG FF41    COPY   1140
 COUNT  01D3    CPYTTL 1213    CRSR   170E    CURLOC 0088
 CURSOR 1750    DATARG FF40    DCONT  138D    DDRSET 0F5D
 DERROR 11BF    DEV    14EA    DEVNUM 006F    DEXIT  15E9
 DIFF   124B    DISDAT 151E    DLOOP  102E    DMLOOP 13E1
 DMPTTL 149C    DMPXT  147B    DONEYT 108E    DOT    1445
 DOWNCT 1005    DSTRT  14CA    DUMP   1374    DWAIT  146F
 EKEY   12A3    EMPTY  0FC4    ENDADD 007E    ENDMSG 12D6
 ENDTXT 16E0    EPROM  0E00    ERAMSG 10C2    ERASE  103E
 ESTRT  14DA    EXECAD 01E5    EXEMSG 16F5    FILMSG 1697
 GDUMP  13B0    GETKEY 1710    GETST  1159    GOOD   1111
 GOODP1 1304    GOODP2 1320    GOODPR 11E2    GTHEX  1769
 GTKEY  155B    HEX    177B    HEXASC 17B4    HEXERR 1799
 HEXINT 1760    HEXIT  178B    HEXOUT 17CB    HIADD  FF46
 HIGH   126C    HXPAIR 179F    INIT   0F3B    INKEY  173E
 INLOOP 13F5    INPUT$ 17BF    INSTR$ 170A    LOWADD FF44
 MENU   0E03    MENUT  0E4D    MOVCRS 15F0    NADDRS 1640
 NDATA  164F    NEWADD 158C    NEWDAT 15AA    NOBRK  106F
 NODISP 0FB5    NOERSD 15E3    NOROOM 11D1    NOTEXT 17C7
 NOTMTY 109A    NOTNEG 1570    NROOM  1287    NTOVER 1587
 NUMK   0008    NXLINE 1463    OKPRNT 1447    OLOOP  1492
 OUTST$ 175B    PEXIT  100A    PLOOP  0F91    POLCAT A000
 PREXIT 1015    PROGRM 0F68    PULSE  101F    PUTMON 1059
 RLYDLY 0F73    RSTART 13AC    SCR    13CF    SPACES 1490
 STADD  01E7    START  01D1    STRTXT 12BF    TARGET 01D5
 TEMP   01D7    TGTMSG 12ED    TOB16  15AE    TOOHI  11C8
 TOOHIG 1590    TOPADD 1FFF    UNERAS 11FE    UNERSD 133B
 VERFY  111D    VERIOK 0FFA    VEXIT  10B3    VLOOP  1063
 VOLTS  FF43    WRKADD 135C    WARG   0000

 CMD=0:EPROMSRC.SRC /P
```

Correction for Cooking With Coco:

In the July installment, Listing 1 *(BASLOAD)* was inadvertently left out. Listing 2 and 3 were labeled 1 and 2. Here is last month's Listing 1 (which is also on the August RAINBOW on Tape):

200	235
405	233
600	65
END	155

Listing 1 *(BASLOAD)*:

```
10 'THIS WILL TRANSFER BASIC
20 'EXTENDED BASIC AND DISK
30 ' BASIC TO ROM
40 ' CORRECT IT, THEN
50 ' COLD START IT.
60 ' IT WILL WORK WITH OR WITHOU
T
70 ' EXTENDED BASIC OR DISK BASI
C
80 ' IN ROM
90 'NOTE: For Color Basic 1.1 on
ly.
100 'Revs of Ext. and Disk not i
mportant
110 CLEAR 200,32511
120 DATA 32512,41044,41092
130 'RELOCATION PROGRAM
140 DATA 26,80,142,128,0,166,132
,183,255,223,167,128,140,224,0,3
9,5,183,255,222,32,239,28,175,57
150 ' PATCH #1
160 DATA 198,13,189,160,137,18,1
8
170 ' PATCH #2
180 DATA 142,127,254,32,10,167,1
93,90,38,251,206,255,224,57
190 READ S1,S2,S3
195 TT=S1+S2+S3
200 ' LOAD RELOCATION PROGRAM
210 FOR A=S1 TO S1+24
220 READ CODE
225 TT=TT+CODE
230 POKE A,CODE
240 NEXT A
245 IF TT<>117877 THEN PRINT"PRO
GRAM ERROR, PLEASE CHECK":STOP
250 '*SUBROUTINE IS NOW IN
260 'GO EXECUTE IT
270 EXEC 32512
280 SOUND 120,1' ANNOUNCE COMPLE
TION
290 ' OVERLAY PATCH #1 PREVENTS
MEMORY TYPE
```

```
300 ' FROM BEING SWITCHED BACK T
O ROM/RAM
310 FOR A=S2 TO S2+6
320 READ CODE
325 TT=TT+CODE
330 POKEA,CODE
340 NEXT A
345 IF TT<>118610 THEN PRINT "ER
ROR IN PATCH #1, PRESS RESET, RE
LOAD 'BASLOAD' AND CHECK":POKE11
3,0:STOP
350 ' PATCH #2
360 ' INITIALIZE PARALLEL PIA
370 FOR A=S3 TO S3+13
380 READ CODE
390 POKE A,CODE
395 TT=TT+CODE
400 NEXT A
405 IF TT<>120656 THEN PRINT "ER
ROR IN PATCH #2, PRESS RESET, RE
LOAD 'BASLOAD' AND CHECK":POKE11
3,0:STOP
410 ' CLEAR COLD START FLAG
420 POKE 113,0
430 'START UP BASIC
440 EXEC40999
450 ' THIS IS THE ASSMEBLY SOURC
E FOR THE
460 ' ABOVE CODE SEGMENTS
470 '*****************************
*
480 '* BASIC RELOCATOR
490 '          ORCC #$50 DISABLE
 INTERRUPTS
500 '          LDX #$8000 BASIC
START ADDRESS
510 'LOOP      LDA ,X GET A BYTE
520 '          STA $FFDF SWITCH
TO RAM MAP
530 '          STA ,X+ PUT BYTE
IN RAM
540 '          CMPX #$E000 END O
F BASIC
```

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```
550 '          BEQ DONE ALL MOVE
D LEAVE IN RAM MAP
560 '          STA $FFDE SWITCH
BACK TO ROM MAP
570 '          BRA LOOP CONTINUE
 MOVING
580 'DONE      ANDCC #$AF ENABLE
 INTERRUPTS
590 '          RTS RUNNING IN AL
L RAM SYSTEM
600 '*****************************
*****
610 '*PATCH 1 PREVENTS SAM FROM
BEING SWITCHED
620 '*BACK TO ROM MAP TYPE DURIN
G BASIC STARTUP
630 '          ORG $A054
640 '          LDB #0D ADDRESSES
 TO SET IN SAM
650 '          JSR $A089 JUMP TO
 NEW SETUP CODE
660 '* SPACE FOR THIS NEW ROUTIN
E IS MADE
670 '* AVAILABLE BY THE REMOVAL
OF THE MEMORY
680 '* SIZING ROUTINE IN PATCH #
2. MEMORY MUST
690 '* BY 32K TO EVEN BE DOING T
HIS.
700 '*****************************
*****
710 '*REMOVE MEMORY SIZE ROUTINE
 AND INSTALL
720 '*SAM SETUP ROUTINE FOR PATC
H #1
730 '          ORG $A084
740 '          LDX #$7FFE MEMORY
 SIZE
750 '          BRA CONT DO REST
OF ORIGINAL CODE
760 '*******
770 '* INITIALIZE SAM
780 'INIT      STA ,U++ WRITE TO
 SAM
790 '          DECB     COUNTER
DOWN
800 '          BNE INIT DONE ALL
 ADDRESSES?
810 '          LDU #FFE0 RESET U
 FOR REST OF CODE
820 '          RTS TO CODE AFTER
 PATCH #1
830 '          NOP FILLER BYTE
840 'CONT      EQU * FIRST BYTE
OF OLD CODE
850 '          END
860 '*****************************
*******
```

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TURN OF THE SCREW

Popular Misconceptions And Common Problems

Tony DiStefano
Rainbow Contributing Editor

In the past three and a half years I have learned much about the Color Computer. Playing and poking around inside I compiled lots of information about how this computer works. I listen to everyone that has something to say about it, in case I learn something new. If I do, I immediately race home and try it out. To see if what I heard or what I saw really works or is true. However, not everything I hear is right. This brings me to this month's topic. I will try to clear up the "hearsay" and "did you know" about the Color Computer. Some of them are started by good ol' Radio Shack and others are started by well known people in the Color Computer circles, but most are started by people who misunderstand something and repeat it to someone else. Nevertheless, where ever they come from, I would like to clear up the ones I am familiar with.

The first one pertains to disk drives and disk controllers. Some believe that the new 1.1 disk controller needs and gets its 12 volts from the power inside the disk drive. That means that the 1.1 controller can only work with the newer white drives. This is simply not true. The new 1.1 controller does not get 12 volts from the disk drive. The fact is the engineers at Radio Shack redesigned the 1.1 disk controller so that it *does not* use 12 volts. They used a different controller chip and data separator in the 1.1 controller. They did this so one could use this controller in the newer CoCo 2. You see, the CoCo 2 has no 12 volts inside, so the older controllers would not work with it. This is the way it is. The older 1.0 controller will work with the regular CoCo only. The newer 1.1 controller will work with both the regular CoCo and the CoCo 2. The older gray disk drives will work with either controller without any modification. The newer white disk drives will work with either controller without any modification.

(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

The next misconception is that some software can damage your hardware. This, in most cases, is not true. The software cannot hurt the hardware. If the software crashes (does not work right), then at most, you could erase a disk if it was not write protected and the door to the disk drive was closed. You will lose what you have in memory, or turn the cassette player on and if it is in the record mode, you could write on top of something important. If you see garbage on the video screen or see the sync break up and the picture tear all across the screen, just turn the computer off, wait for 15 seconds, then turn it on again and all is well. This will not hurt the computer. The only case where I can see a problem is if the software turns the cassette relay on and off repeatedly at a high speed. If you were to leave this condition for a extended length of time, it could burn out the relay. I have never seen this happen to my computer. Another highly unlikely problem could exist with a disk drive. If the software were to bang the read/write head repeatedly to track 0, the head could get out of alignment. But again, you could stop it before any damage could result.

The third misconception involves memory. So many people call me and say, "I just had a 64K upgrade put in my computer. How come when I type *PRINT MEM* I get less than 32K? Did I only get 32K? Where are the other 32K?" I covered this topic in an article last year but the amount of times I hear this question warrants me to explain it again. The CPU inside the CoCo and the CoCo 2 is an MCM6809. This CPU can only access or work with 64K memory total, ROM and RAM total. When you turn on your computer, a total of 32K memory is reserved for BASIC, Extended BASIC, and Disk Extended BASIC. This right away leaves only 32K left for *PRINT MEM*. The rest of the memory difference is being reserved for such things like video area, graphics pages, I/O buffers, and variables. The other 32K of RAM is sleeping. BASIC cannot get to it because it does not know how to wake it up. It takes programs that are written with 64K in mind. Programs that know how to wake up the sleeping 32K are usually advertised as being able to make use of the full 64K. They will perform a test to see how much memory is available and make use of all of it.

The second part of this month's article is about common problems. There are a lot of little quirks that bother the average user about the CoCo. The biggest one I can think about is with disk drives. The ever popular I/O Error. What a nightmare when the project you were working on for hours is lost to an I/O Error. There are a lot of so called "fixes" for I/O Errors, like hiding the directory on track 35 or backups of backups of backups. Then there are those programs that try to recover your lost files. Don't get me wrong, they are good programs and I did have to recover files myself, but if you have a lot of I/O Errors, it might be wise to take a look at your hardware. I get a lot of letters from people who have these problems.

Here are some good tips on how to prevent disk I/O Errors. The most common cause of errors is the connection between the controller and the computer. The Radio Shack controllers have lead-coated contacts and they get dirty. They oxidize and prevent the signal from going through. Some say to clean the contacts with a soft pink eraser. Others say that it is no good and say to use alcohol and a Q-Tip. I say use both. First the eraser to clean the big dirt and then the alcohol to mop up. It works great!

Some of the older disk drives have problems with speed. The speed drifts and causes I/O Errors because the drive belt slips due to excess oils present in that area. What you have to do is remove the cover and clean the belt. Clean your heads regularly. Finally, remember to always open the drive door whenever you are not doing I/O to disk. If your program crashes, there is no chance that it will garble your disk. Always have the door open when turning your computer on.

The next common problem is the Radio Shack keyboard. Sometimes the older keyboard keys can stick or give double characters. The best way to clean this would be to take it all apart and clean each key one by one. But if you take it apart you will be greeted with a springy surprise. Yes, many little springs are inside the keyboard. A much easier way to clean a key is to squirt a little shot of lighter fluid into the space around the key and quickly press the key several times. Do this again if the problem persists.

The last problem that is common to the CoCo user (especially the old "D" and "E" boards) is in the power supply. The symptoms are strange. At first, it might look like the software has crashed. Then, the screen might go blank . . . all white, no control. Hitting the Reset is no help, but turning it on and off fast sometimes fixes the problem. It sounds like the power switch is defective, but that is not the problem. The current sensing resistor is likely out of tolerance. It is supposed to be a .33 ohm two-watt resistor. The resistance in one case was up to .47. That gave a false reading to the current sensing amplifier. Then the five-volt section of the power supply shut down, thinking that there was a short, causing the computer to fail. The 12 volts to the RF adapter was still on. That gave the blank screen effect. To solve this problem change the resistor, with the same value, of course. On the "D" and "E" board it is R66 and on the "F" board it is R24.

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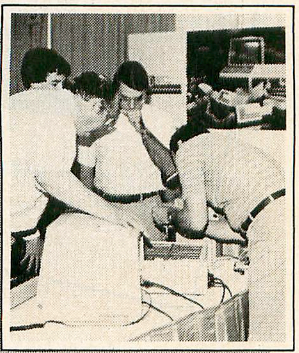

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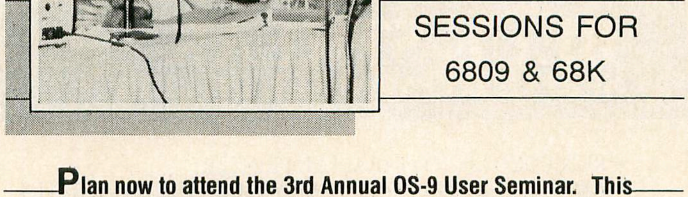
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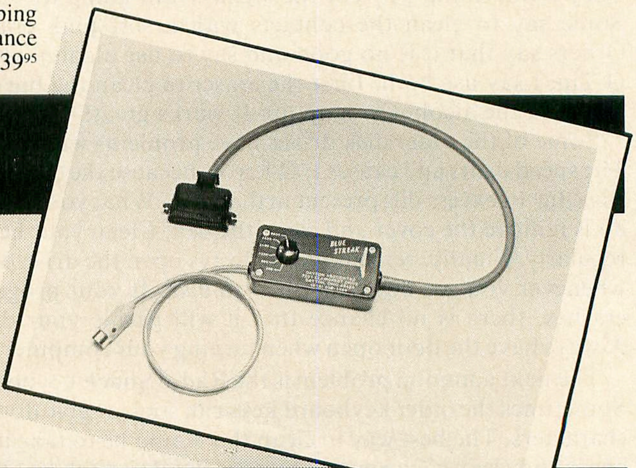

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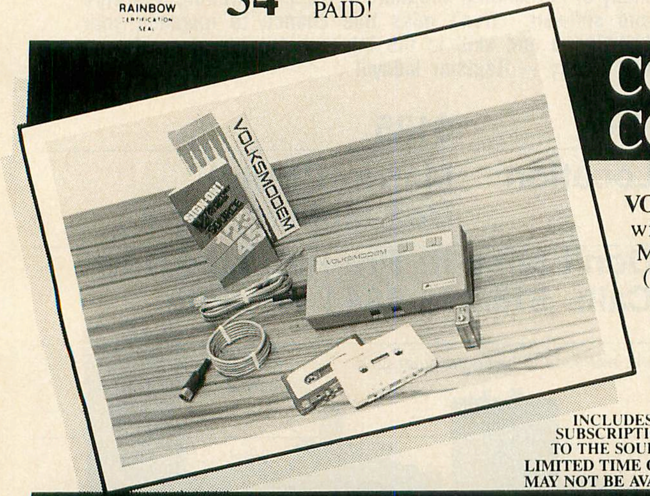

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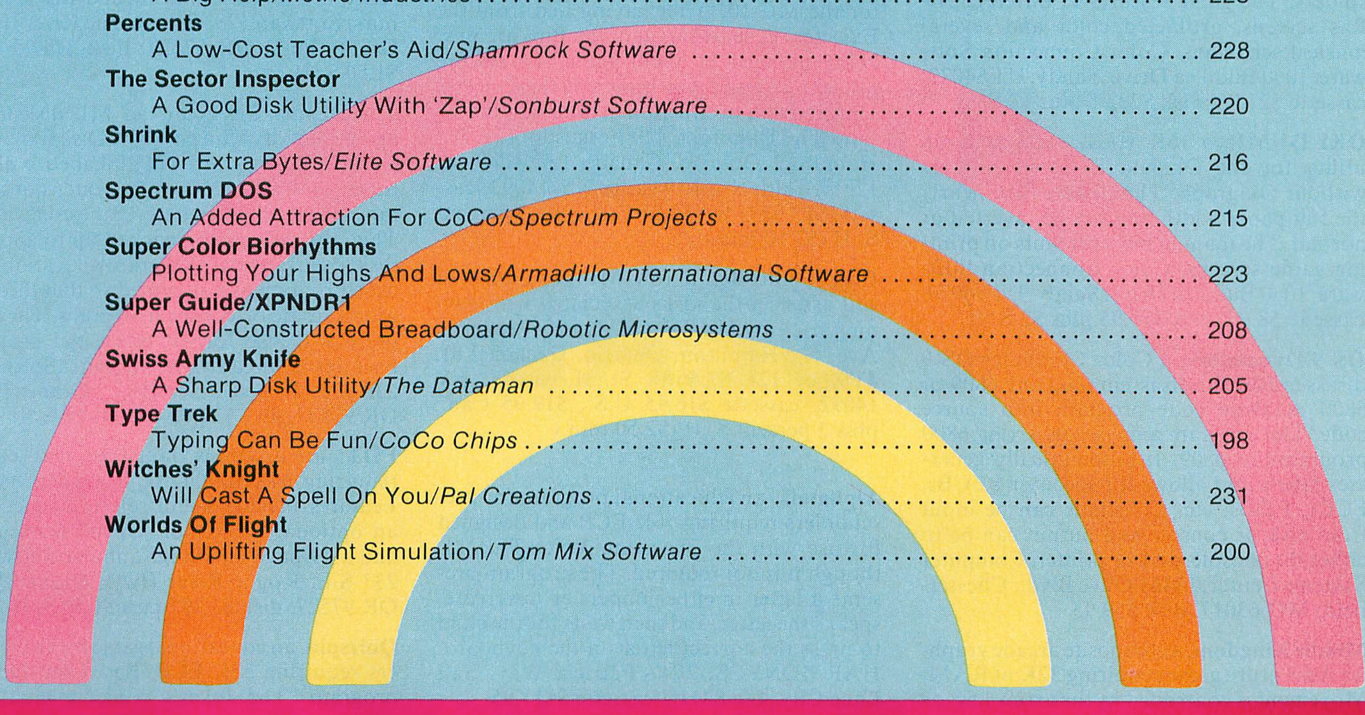

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The following products recently have been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be. This month the *Seal of Certification* has been issued to:

Personal Bookkeeping, a personal accounting program requiring 32K Extended BASIC, one disk drive and a printer. The program handles 25 accounts, supports 26 expense categories, records taxable and nontaxable income, and allows for notations to each check or expense. File searches can be performed on nine different fields and a user-definable password access system protects the confidentiality of your data. AMDT-Stardancers, 762 Brady Avenue, Bronx, NY 10462, disk $27.95 plus $1.50 S/H

Spooler, an ML utility requiring 64K of RAM and Extended Color BASIC. The program sets up a software printer buffer of nearly 8,000 characters in high RAM and permits the user to regain control of his CoCo faster than during normal operation. It is totally transparent and uses memory not ordinarily used. *Spooler* is being marketed through the freeware concept — forward a blank cassette tape or formatted disk and postage-paid mailer to obtain a copy. The CoCo Freeware Clearinghouse, P.O. Box 1084, Morgantown, WV 26507, free on supplied medium — contributions accepted

MegaMunk, a 32K ML strategic arcade-type game requiring one joystick. As a soldier of fortune in a civilization of monkeys, you accept the King of Ledonia's challenge to save the forest from the invading monster spiders. The game features 11 different Hi-Res screens, artifacted color and several musical selections. Color Connection Software, 1060 Buddlea Drive, Sandy, UT 84070, cassette $21.95, disk $23.95 plus $2 S/H

OKI DUMP, a 16K Hi-Res screen dump utility for the Okidata 80 series printers without Okigraph. The pictures are nearly the full paper width and can be inverted or normal. The manual includes hints on printing game screens. Color Connection Software, 1060 Buddlea Drive, Sandy, UT 84070, cassette $8.95, disk $10.95 plus $2 S/H

OS-9 Dynamite+, a Color Computer OS-9 disassembler for disassembling any 6809 or 6800 machine code program into source code. The program aids in converting 6800 programs to 6809. It automatically generates labels and allows for specifying FCBs, FCCs, FDBs, etc. Constants can be input from disk or console and output can be to either the console, disk or printer. Computer Systems Center, 13461 Olive Blvd., Chesterfield, MO 63017, disk $59.95

Middle Kingdom, a composite arcade graphics Adventure game requiring 32K of RAM. Movement is controlled by the arrow keys as you search the Pyramid, the Temple, and the Catacombs for the three magic rings. When you return with them to the Sanctuary, you will become the new ruler of the Middle Kingdom. Computerware, P.O. Box 668, Encinitas, CA 92024, cassette $24.95, disk $27.95, plus $2 S/H

Star Trader, a graphics Adventure and Simulation requiring 32K for cassette and 64K for disk, Extended Color BASIC, and either a joystick or mouse. You assume the role of a merchant ship captain, traveling between solar systems and trading for cargo. Your goal is to collect 1,000 credits so you can retire in luxury from the dangerous life of solar trading. Gauges in the cockpit indicate your location, current damage status, credit balance, cargo destination, location of nearby starships, fuel supply, laser power levels, and the current date. Computerware, P.O. Box 668, Encinitas, CA 92024, cassette $24.95, disk $27.95, plus $2 S/H

The Music Collection, Part I, a BASIC compilation of music requiring 16K of RAM and Extended Color BASIC. The program is an assortment of favorite melodies, including folk songs, Christmas songs, classics, and songs to entertain children. Creative Chris Enterprises, 3701 Shannon Drive, Harvey, LA 70058, cassette $5.95

Adventure in Bipland, a graphics Adventure for the MC-10. After having fled from the Exjecters generations ago, the Bips are now being pursued by them again. To restore peace to Bipland, you must slay the Exjecter king and halt production of their new invention. The Dataman, 420 Ferguson Ave. N., Hamilton, Ontario, Canada L8L 4Y9, or 125 S. Fifth St., Lewiston, NY 14092, cassette $13.95 U.S, $15.95 Can., plus 3 percent S/H ($2.50 min.)

Club Controller, a 16K ML program that will assist in the tasks associated with running a club. The Dataman, 420 Ferguson Ave. N., Hamilton, Ontario, Canada L8L 4Y9, or 125 S. Fifth St., Lewiston, NY 14092, cassette $16.95 U.S., $19.95 Can., plus 3 percent S/H ($2.50 min.)

Alphatalk, an educational program for preschoolers requiring 16K ECB and designed for use with the Spectrum Voice Pak, although it is not required. The program presents a letter in either upper- or lowercase, speaks the letter, and then waits for the child to press the correct letter on the keyboard. HARMONYCS, 1747 Patricia Way, Salt Lake City, UT 84116, cassette $$11.95

Stellar Life Line, an ML, arcade-type space game requiring at least 16K of RAM; joystick control is optional. As the commander of a fleet of spaceships, your mission is to clear a path among the stars so that your fleet can travel from one starbase to another. But blocking your path are asteroids, magnetic mines and alien attack ships that threaten to destroy you. Radio Shack Stores nationwide, Cat. No. 26-3047, ROM Pak $19.95

System Secrets, a comprehensive guide to *PEEKs*, *POKEs* and *EXECs* for the Extended BASIC and Color BASIC Color Computers. Put power into your programming with this 18-page booklet printed on 8½ x 11-inch, single-sided pages. RC Creations, 17251 Palatine N., Seattle, WA 98133, $5.95 plus $1.50 S/H

Super-Disk Charger 1.12, a machine language program that increases the disk step rate by 2.5 to six times over the normal step rate of 30 ms. This speeds up all disk operations, decreases mechanically generated noise from the drive head, and helps the drive last longer. The program supports both single- and double-sided disk drives. Reitz Computers And Electronics, 3170 W. Central Avenue, Toledo, OH 43606, disk $21.95

Dapper, a disk "mapper/zapper" utility program requiring 32K and Disk Extended BASIC. It enables the user to certify disk quality; to backup to and restore from tape; and to recover data from, repair, and restructure bad disks. Sadare Software, P.O. Box 3891, Gaithersburg, MD 20878, disk $14.95

The Archivist, an ML utility requiring 64K Disk Extended BASIC. The program is primarily for making backups of disks to tape. Also, it will erase and format disks. Sonburst Software, 233 S.E. Rogue River Hwy., Grants Pass, OR 97527, disk $14.95 plus $1.50 S/H

The Deputy Inspector, an ML disk management utility requiring 64K Disk Extended BASIC. The program will alphabetize directories, sort the entries by extensions, or move them around wherever the user wishes. Then the disk can be backed up to another disk, rearranging the gran allocations of each program as it is copied so that the programs reside on consecutive grans. The program will also format disks and produce backups in three swaps. Sonburst Software, 233 S.E. Rogue River Hwy., Grants Pass, OR 97527, disk $21.95 plus $1.50 S/H

EDT, an assembly language text editor requiring 64K and Disk Extended BASIC. Features include menu selected functions, an optional "center of screen" work area, and a 49-page manual. Sonburst Software, 233 S.E. Rogue River Hwy., Grants Pass, OR 97527, disk $35.95 plus $1.50 S/H

Quizspin, an educational game for two players requiring 32K ECB. Based on the TV program "The Joker's Wild," a multiple-choice question is asked by the computer from the category selected by the player. There are five categories to choose: presidents, states and capitals, mystery, chemistry and math. Hi-Res graphics are featured. Spectral Associates, 3416 S. 90th, Tacoma, WA 98409, cassette $24.95, disk $28.95, plus three percent S/H ($2 min.)

ADOS, an enhanced version of Disk BASIC that requires 64K for RAM use or can be burned into an EPROM to replace the Disk BASIC ROM. Features include: repeat and edit of the last direct-mode command; control key abbreviated entry of BASIC commands; automatic line number prompts for program entry; lowercase command entry; DOS command for booting OS-9; one- or two-column directory with free grans to screen or printer; *COPY "filename" TO (drive number)* command; AE Error override option for *COPY* and *RENAME*; RUNM command to load and execute machine language programs; RAM command for ROM-to-RAM transfers; SCAN command lists ASCII files to screen or printer and gives start, end and execution address for binary files; PEEP command provides movable window for inspecting memory contents; compatible with all commercial software. SpectroSystems, 11111 N. Kendall Drive, Suite A108, Miami, FL 33176, disk $27.95 plus $2 S/H

The Peeper, an ML utility requiring 16K of RAM. The program is an interrupt-based program tracer that allows the monitoring of machine language programs while they are running. Switching can be accomplished between watching the program's regular output and watching *Peeper's* trace output of registers and stack, either on screen or printer. Execution speed can be varied while the program is running, from moderate slowdown up to several thousand times slower than normal. It supports single-stepping, break points, memory examine/change, and movable windows to view memory in any graphics mode. SpectroSystems, 11111 N. Kendall Drive, Suite A108, Miami, FL 33176, cassette (copyable to disk) $21.95, with assembler listing $24.95, plus $2 S/H

Blackjack Royale, a new version of the Hi-Res graphics casino blackjack simulation and card counting tutor requiring 32K of RAM. Playing features include: double down, splits, surrender, insurance bets, one to eight decks, burnt cards and shuffle frequency. Improvements over the older version include: graphics are done in machine language for faster play; the deck point value bug has been corrected; and a new pit boss feature has been added. Spectrum Projects, P.O. Box 9866, San Jose, CA 95157-0866, or P.O. Box 21272, Woodhaven, NY 11421, cassette/disk $24.95, plus $3 S/H

Radio Systems Design Calculations, a program requiring 16K ECB for the tape version and 32K ECB for disk. It can be used to design, evaluate and modify land mobile radio systems, satellite TV and satellite data acquisition systems, TV and Broadcast FM systems, microwave systems and aircraft radio systems. Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, 16K/32K cassette $29.95, 32K disk $32.95, plus $1 S/H

Concordance, a 32K ML program that allows you to list the correlated references in a BASIC program, thereby aiding in debugging efforts. In addition to a standard listing, the program outputs a pretty print type listing which breaks each BASIC line into a more readable form, and the concordance listing, which provides a correlation of all *GOTOs*, *GOSUBs*, *PEEKs*, *POKEs*, and variables that reference the same line. Echosoft, 17 Skyline Dr., Shalfont, PA 18914, cassette $19.95, disk $24.95, plus $2 S/H

Continents and Oceans, a three program educational package designed for ages eight to 13 requiring 16K ECB. Through games, quizzes, and Hi-Res graphics representations, the programs help children to establish the locations, shapes and proper spellings of the continents and oceans of the world. Thompson House, P.O. Box 58, Kamloops, British Columbia, Canada V2C 5K3, three cassette package $24.95

WP, a BASIC word processor program requiring 32K of RAM. The program also functions as a database manager with complete control over printing every character. Also, special graphics alphabets can be generated, including large multiline characters. The program is user-modifiable and is accompanied by a 57-page instruction booklet. Bob Vercler, R.R.#2, Chenoa, IL 61726, cassette $35

Workbase I & II, two database systems designed for business and requiring 32K of RAM, Disk Extended BASIC and at least one drive. The program includes database, spreadsheet, mailmerge and word processing capabilities all in a single integrated package. *Workbase I* can handle up to 400 records and *Workbase II* can handle 1,200. Both can be defined to support all currently available printers and include a demonstration disk. Workbase Data Systems, P.O. Box 3448, Durham, NC 27702, *Workbase I* $64.95, *Workbase II* $79.95

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in THE RAINBOW. By awarding a *Seal*, the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW's reviewers for evaluation.

— Kevin Nickols

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reviewing REVIEWS

XPNDR1

Editor:

In this issue of THE RAINBOW, Dan Downard summarizes his review of the XPNDR1 bare breadboard by suggesting that it be redesigned. Certainly, to an experienced hardware person, the XPNDR1 may lack specific features preferred by one individual or another, but what of all the adventuresome CoCo users who have yet to build their first circuit; what does the XPNDR1 offer them? I don't think they need more space nor a more complex pattern of holes. I do think they need simplicity in a technically correct design. That's what the XPNDR1 is all about; those are the people I had in mind when I designed the board and wrote the eight-page application notes to go with it.

Since there are very few high quality CoCo breadboards available, though, the XPNDR1 is also for the skilled experimentalist who will have no problem obtaining results. (Need a lot of holes? Cut out the center of the XPNDR1 and epoxy in a section of perf board. Got a few resistors and capacitors to add? Insert them into the holes and go ahead and wirewrap to them. Wirewrap pins are square so the wire can bite into the sharp corners; in the case of round leads, a tiny dab of solder will ensure long-term reliability.) I favor wirewrap and would encourage anyone attempting to build expansion hardware to do the same; the tools can be inexpensive and the technique can be learned in a few minutes. In professional electronics, breadboard and wirewrap are nearly synonymous.

When designing the XPNDR1, my first specification was that all copper traces terminate on plated-through holes because they provide far superior solder connections. This introduces two constraints, however; the holes must be drilled rather than punched and the board must be rigid glass/epoxy. You can't plate punched holes (too ragged) and a flexible board will crack the plating. But drilled holes are two for a penny and it would be easy to have a very expensive board. The trick becomes getting the most utility from a reasonable number of holes. I think I did pretty well. Too many holes would also compromise the wide power and ground buses which are intended to eliminate potential noise problems many users would have no way of understanding.

Not to be overlooked is the CoCo power supply. While the XPNDR1 card will not hold enough CMOS to cause trouble, CMOS can be tricky to work with in the CoCo environment and many users will choose TTL and NMOS. In this case, the power supply current limits will be reached long before the board is stuffed to capacity. The XPNDR1 card fully supports the vast majority of digital ICs that will be interfaced to the CoCo; one or two LSI chips, a few smaller ICs for discrete logic and the user can have an awesome interface to the world outside the CoCo — with room to spare. What the XPNDR1 does not support well is a large analog application with the concomitant multitude of components (that's why digital was invented — to eliminate that stuff!).

The SuperGuide, incidentally, is really a breakthrough gadget for the CoCo and will probably work with almost any printed circuit board that can be plugged into the ROM connector.

Reviewing products for a magazine is no doubt a tough assignment at times. The main thing Mr. Downard could not know is that XPNDR1 is intended to be exactly what it is — a simple but very useful introductory product and that I designed it knowing what the more advanced XPNDR2 looks like. Thanks.

Herb Hart
Robotic Microsystems

ATTENTION PROGRAMMERS

Mr. Szlucha's review of *CGP115SD* was correct in that it takes a long time for this program to dump a screen to the CGP-115 printer. But he was less than accurate when he said this was a "simple program designed to reproduce color for color, dot for dot. . . ." *CGP115SD* not only reproduces what is on the screen exactly, it does it twice, so that the printed picture is enlarged to twice the size of what a simple "color for color, dot for dot . . ." would be able to produce. Therefore, this program is not reproducing the usual 49,152 pixels; it is sending almost 150,000 pixels to the printer. The time that it takes to dump this large a picture is more than compensated for by that quality of the final printout. There are other programs on the market that do dump faster, but all that I have worked with do not compare to the quality of the *CGP115SD* printouts. Art, in any form, is a matter of quality, not quantity or speed.

When I want to dump a screen, I do it just before I go to bed. I first check to make sure the dump has started with no errors and then I leave it on its own. When I awaken in the morning, the dump is finished and the time it took does not interfere with any of my other activities with my CoCo.

I do agree with Mr. Szlucha that this type of program needs the speed of machine language, but as is the case with most CoCo owners, I do not know machine language. Derby City Software is just one person — me. I had originally written *CGP115SD* for myself, because I was not happy with the quality of the screen dumps that were currently on the market. Other owners of the CGP-115 that I shared my program with were impressed enough with *CGP115SD* that they suggested that I should try to make it available to other hobbyists who own the CGP-115 printer. A friend who knows machine language is currently rewriting *CGP115SD* for me. When it is finished, it will be made available. For those persons who have already bought *CGP115SD* in the BASIC language form and wish to have the new machine language version, they will be allowed to make a straight exchange at *no extra charge*.

Mr. Szlucha was also very unfair to the readers of THE RAINBOW who are owners of the CGP-115 in that he failed to mention any of the other features that this program also makes available to the user. What follows is a list of these features:

1) The *CGP115SD* dumps *all PMODEs*, not just *PMODE4* or *PMODEs 3 & 4*.
2) To save ink and time, the user may easily delete the background color from the dump.
3) *CGP115SD* takes in the fact that there are alternate color sets, such as the black, buff, cyan and orange color set used by many of the game programs (which, by the way, Radio Shack doesn't mention in its documentation).
4) In *PMODEs 0, 2* and *4*, *CGP115SD* allows easy reversal of the foreground and background colors.

All of the features of the *CGP115SD* program are extremely user friendly. In fact, most of these features are accomplished by the program in a way that is invisible to the user.

Mr. Szlucha also states in his caustic review of the *CGP115SD*, and I quote, ". . . this program is overpriced. *CGP115SD* is selling for about twice the price. . . ." At the time I submitted *CGP115SD* to THE RAINBOW for review, there were two other companies advertising screen dumps for the CGP-115 printer, both of which had fewer features and a lesser quality final printout than the *CGP115SD*. I choose an in-between price.

Mike Standefer
Derby City Software

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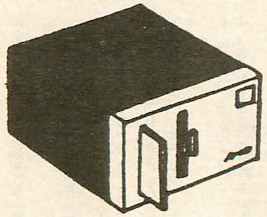

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Arrange Your Disk Directory Alphabetically With *Alpha-Dir*

Having a disk drive hooked up to my Color Computer is a nice feeling. I enjoy it. Having a large library of programs for the many applications I use my computer for is even a nicer feeling. The storage of data on this particular medium has its own nuances though. One of them is if you have a disk full of programs and you decide to kill one of them. The next time you save any program to that disk, the name of the newly saved program will occupy the "slot" or space of the one you previously killed. It gets even more confusing if you kill a number of programs.

A certain way to know which slot a given program will occupy would be to alphabetize each disk's directory. It would make things easier.

Alpha-Dir from Microcom Software is just such a program and it operates very simply. After the program is loaded you should insert the disk that you wish to alphabetize and type *RUN.*

At this point *Alpha-Dir* will read in your directory from track 17, sectors two through 11, sort it, and write it back out in alphabetical order. When finished, you will be told how many of your disk's granules are unused and the quantity that are occupied. Also displayed are the number of bytes used and free.

When using *Alpha-Dir,* one should take care to remove any write-protect tabs that may be in place, otherwise you won't get much of a result!

The time it takes for *Alpha-Dir* to finish a run is very quick indeed. However, for some unknown reason, the author of the program put a *POKE 113,0 EXEC 40999* into the program that does a cold start after the directory is sorted. If I were to use this program, I would probably sort all of the directories in my whole collection at once and would not appreciate a restart after each sort. However, if you list the program and remove the above pokes, you can keep rerunning the program.

The documentation enclosed with the program consists of a single sheet of paper. There really isn't need for more since the program is automatic and only performs one function.

Alpha-Dir performs as advertised, although the cassette version did not load and I thought that it was high priced, especially since most popular Bulletin Boards have this as a standard download selection.

(Microcom Software, P.O. Box 214, Fairport, NY 14450, $6.95 tape, $14.95 disk)

— Steve Schechter

MUL-T-SCREEN

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Our Princeton, New Jersey, show is being held at the Hyatt Regency Princeton, which offers special rates for **RAINBOWfest**. The show opens Friday evening with a 7 p.m. to 10 p.m. session. It's a daytime-only show Saturday — the CoCo Community Breakfast is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs continuously until 6 p.m. There will be no exhibition hours or seminars Saturday evening. On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

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Worlds Of Flight — An Uplifting Flight Simulation

By Dr. Laurence D. Preble

Preflight check is complete, radio and lights off, master switch on, brakes on hold, ignition switch on both, clear prop and start! Great, the engine kicked right over. We're idling about 600 rpm.

Radio is set, proper frequency. "Dahlgren Tower, this is CoCo three six zero two Alpha, ready for takeoff with information Zulu. Requesting radar service eastbound to the practice area."

"Roger, zero two Alpha. After departure, fly heading zero niner zero, climb and maintain 1500 feet, squawk 4237. Departure frequency will be 124.5."

Now I read back the departure instructions to the tower and prepare for takeoff. "Read back is correct zero two Alpha, cleared for takeoff. Wind check 030 at fifteen knots."

I tell myself, "Be careful, we've got a crosswind and those rudder pedals are touchy. I don't want a ground loop." The sweat is pouring off my brow. I release the brakes, throttle up. We're rolling! We pick up speed, we rush by the tower on the left. Careful now, a little light back pressure, rotate and we're off! Set trim control for normal climb attitude. The bridge, and power plant loom in the distance. Keep her climbing . . .

"Zero two Alpha, right turn out is approved. Contact departure." I thank the tower and bank her gently to the right. A little extra back pressure on the stick is needed in the turn. Oops! We're side slipping. Center that ball with a little extra right rudder. We're on our way!

I feel a gentle tap on my shoulder. Oh, it's Peggy, my wife. "Dinner is ready," she says. What a great hostess! "Thanks, honey, I'll take it here." She flashes me one of her wry smiles, "Nope, Ace, you'll take it in the dining room."

"Dining room! But . . . " Oh well, I press ENTER and the view out the window freezes in place. I'll just have to finish this flight later. The engine sounds stop. But we're not falling!

No, this is not where Rod Serling walks in from the "Twilight Zone." It's Tom Mix Software's new *Worlds of simulator for the Color Computer.*

Tom Mix and company have outdone themselves, again. The *Worlds of Flight* simulator is surprisingly realistic. *Worlds of Flight* is a view-oriented flight simulator which contrasts sharply with previous instrument-only simulators for the CoCo. The software comes on cassette (soon on disk, too) with 22 pages of instruction. Believe me, you need the instructions. This is not really a game.

The *Worlds of Flight* simulator experience bears considerable resemblance to real flight. No, it is not a game, but it sure is fun!

All of the basic flight controls and primary instruments are simulated. In addition, there are several special features available such as the overhead radar view of the flight path.

The view out the "window" is simulated with "wire" (or line) graphics. The view changes in real time and appears three dimensional. *Worlds of Flight* gives you nine different "Worlds" from which to choose. Some of these "Worlds" are computer representations of real places, like Dahlgren, Virginia. Some are imaginary. There are mountains to watch out for and bridges to fly under — if you are nuts!

The "aircraft" is a single engine, light sport model capable of some aerobatic maneuvers. The landing gear is retractable. Even flaps are provided.

The software provided is auto-executing and is protected against unauthorized copying. The initial display of the program shows a picture of a single engine light plane doing an aileron roll. Press the ENTER key to exit this display.

The next operation is the Define Worlds mode. Here, the user can choose the location and weather conditions for his flight. If the user does not choose a world, he is left at the practice field (World 5) by default. Press ENTER when ready to begin the Simulation.

The flight Simulation begins with the aircraft positioned on the southern end of the runway facing north. The runways on all the fields face north and south.

Two joysticks are necessary for flight. The buttons on each joystick are pressed simultaneously to start the engine. The right joystick controls ailerons and elevator while the left joystick controls rudder and throttle. If you are already a pilot, it takes an effort to accommodate to this new control configuration.

From the runway threshold, it is possible to begin the takeoff roll. Alternatively, you may opt to taxi the aircraft about the field. There is a nifty refueling station available which you will need to visit sooner or later. Your fuel tank only holds 1.5 gallons!

The scenery at or near the airport is maintained in a bit more detail than the enroute representation. This is necessary since a pilot requires the most visual cues during the takeoff, landing and taxi phases of aircraft operation.

The takeoff roll is best handled with a light touch. Center the rudder control before you begin. Maintain a partial backward deflection of the elevator control throughout the roll. Too high a deflection will result in a stall shortly after liftoff. The aircraft will lift off when airspeed reaches about 42 knots.

In flight, the Simulation approximates real flight operations with reasonably good fidelity. For example, in a turn, lift requirements increase, necessitating an increase in elevator control input. A major (but unavoidable) shortcoming is the lack of control feedback to the pilot. In a real aircraft (or multi-thousand dollar simulator) the flight controls will exert varying amounts of pressure on the pilot's hands and feet. These varying pressures provide much of the kinesthetic information a pilot needs to fly the aircraft. By contrast, model airplane enthusiasts should feel more at home with the lack of pressure cues.

A big help to the simulator pilot is the overhead plan (or radar) view. By pressing the SHIFT and CLEAR keys at the same time, the view will switch to the "bird's-eye" (downward looking) view of the world. A crosshair will mark the position of the aircraft. It is possible to vary the magnification factor (zoom) by pressing a couple of keys. It would be neat if real aircraft had such a feature!

The normal straight-ahead view can also be altered. You can look from side to side and even directly behind the aircraft. You can also change the pitch angle of your view up or down by as much as eight degrees.

The aircraft performance specifications are a bit unusual.

Maximum Gross Weight	600 lbs
Engine Horsepower	40 hp
Fuel Capacity	1.5 gallons
Best Rate of Climb (Vy)	1020 FPM @ 60 kts
Best Climb Angle (Vy)	900 FPM @ 50 kts
Maximum Cruise Speed (Clean)	90 kts
Maximum Dive Speed (Vne)	120 kts
Service Ceiling	8960 feet
Stall speed (Clean)	46 kts
Stall speed (Gear & Flaps)	42 kts
Minimum Takeoff Roll	864 feet
Minimum Landing Roll	506 feet
Fuel Consumption Rate	2.1 gal/hr @ max. Throttle
Maximum Range and Endurance	109 mi in 1.9 hrs @ 50 kts @ Less Than 1500 ft @ 960 rpm
Maximum Roll Rate	20 deg/sec
Inverted Flight Time	Unlimited

The aircraft specifications read more like a sophisticated Ultralight than a normal aircraft. I feel this is a weak point. I would have much preferred that the program simulate the parameters of a real, recognizable aircraft. A Cessna 150, Piper Tomahawk or similar trainer could have been appropriate.

I suspect the limits of a 32K CoCo are being stretched to the maximum to accommodate the *Worlds of Flight* simulator. Naturally, one ought not to expect the extreme realism available on today's airline simulators costing millions of dollars. Still, what *Worlds of Flight* does accomplish is impressive.

I found the flight controls to be a little touchy. Of course, I am used to flying with a real yoke and rudder pedals — not two CoCo joysticks. I am tempted to cobble up a reasonable facsimile of the cockpit controls and hook them to the CoCo.

Also, this simulator is not FAA approved. So you over-ambitious throttle jockeys shouldn't try to log your required flight time on it! I'm serious! As it does with all flight instructors, the FAA sends me a safety newsletter. It seems that some jokers really are trying to get flight simulator credit from two joysticks and their personal computers!

Overall, the Tom Mix *Worlds of Flight* simulator has plenty of the "right stuff."

(Tom Mix Software, 4285 Bradford N.E., Grand Rapids, MI 49506, tape $29.95, disk $32.95)

Hint . . .

Single-Line Scroll

A hint for those of you who are trying to write scrolling games in BASIC — use Lo-Res graphics and use *PRINT @ 511,"";* to scroll the screen up one line.

Rogers George IV
Terrace, MN

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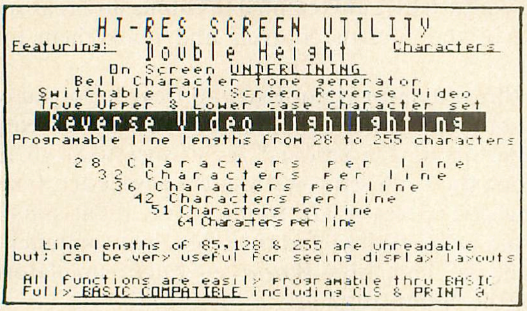

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TEXTPRO III is the most advanced Text Editing and Word Processing System available for the Color Computer. One of the reasons for this is, Textpro works in a totally different way than the other Color Computer Word Processing programs. It uses simple 2 character abbreviations of words or phrases for commands. These commands are used at the beginning of a line and are preceeded by a "." period. Several commands can be chained together on the same line for ease of use. Thru these commands you tell the Word Processor how you want the margins set, line length, indenting information, and so on. You can change the way you want a document formatted at any point in the document. You also have the freedom to write without worrying about how long the line is or where the margins are and so on. The Word Processor automatically takes words from one line to the next and fills out the printed line to the desired length. You can even use the command to Input Text from the Keyboard while a document is being processed, and use that information to change the formatting or enter any other valid text Processor command. With this kind of flexibility and an extensive set of commands and functions available, its no wonder that TEXTPRO III is the most advanced Word Processing System.

Screen Formatting

Textpro III has 9 Hi-Resolution Upper/Lower case display formats available, from 28 to 255 characters per line by 24 lines. You also have advanced screen commands such as double size characters and on screen underlining. You can also use the standard 32 by 16 display for systems having lower case hardware kits installed. The display defaults to a 51 by 24 format that is easily switched to any other format available. Along with the Hi-Resolution screen we added automatic repeating keys "Typomatic." The rate is fully adjustable from ultra fast to super slow or can be turned off entirely for your convenience.

64K Support

Textpro III fully supports the use of 64K on the Color Computer. It has fast automatic memory sensing and configures itself accordingly. Textpro III does not require Extended Basic or Flex to take full advantage of a 64K RAM system. On a 64K Disk System there is over 64K of workspace available and files larger than memory are fully supported. Tape based systems have up to 48K available for workspace.

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Textpro III has a full featured, line oriented screen editor. It supports single or multiple line copy and move, global or local search and replace of any character string, character insert and delete, block delete, adjustable speed automatic key repeat, single and automatic line edit, programmable underline and double width control coded, change screen background color and line lengths, automatic line numbering, line resequencer, and insert and delete line numbers.

Disk & Tape I/O

Textpro III uses fully compatible ASCII formatted files that do not have to be converted like some of the other Word Processing Systems. It will load, save and verify basic ASCII formatted tape files. The disk version supports Load, Save, Directory, Kill, Append, Text Process file from Disk, Roll part of file to disk and get next portion of file from disk.

DISK $59.95 **TAPE $49.95**

Standard Commands

Textpro III features a whole host of Document Formatting commands. The setup command section includes: Line Length, Top, Left, and Bottom Margins, Page Length, Page Numbering on/off and Automatic Word Fill and Justification on/off.

Some of the vertical control features include: test for number of lines left on the page, skip to next page, set page number, wait at top of page, single and multi line spacing, and skip blank lines.

Textpro III features 3 programmable header lines that can be centered, left or right justified. It also has one programmable footer line. 3 commands for continues, single and paragraph indenting, center text, underline and double width print commands.

Footnotes and Special Commands

Some of the special features allow imbedded control codes to access intelligent printer features like; superscript, subscript, change type font and even graphics. You can even imbed control codes within justified text. There is a command that automatically places footnotes at the bottom of the page, which can be very handy for term papers, etc. Another command allows you to display a message on the screen and input text from the keyboard. This text is then printed as if it has been part of the original text, thus you can produce things like a personalized form letter. There is also a repeat command that allows you to repeat an entire document or a part of one as many times as needed up to 255 times. This can be used to produce mailing labels or combined with the previous command to produce a selected number of personalized form letters.

Tab Functions

Textpro III features an elaborate system of tab commands for complete control over column formatting. There are 10 programmable tab stops that can be defined or re-defined at any time in the text file. They can be used with the following tab commands; Center Over Tab Column, Right Justify to Tab Column, Decimal Align Over Tab Column, Left Justify to Tab Column (Normal Tab) and Horizontal Tab. Tab functions may also be used with a numeric tab column position for maximum flexibility. You can also define the Tab Fill Character to any printable character to fill in the blanks with dots, dashes, etc.

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CGP115SD — A Screen Dump For The CGP-115

Doesn't everyone who has a CGP-115 printer want to have his own color picture of "Mario" fighting "the King" to carry in his wallet. After all, there has to be some practical use for all this hardware, especially the new CGP-115 printer that you just bought.

To obtain a printed copy of a CoCo screen display you need software called a "screen dump." This type of software is written to interface the graphics display with a specific printer. *CGP115SD* is a program designed to create screen dumps on the CGP-115.

Unfortunately, this review is rather unfavorable. You may decide to look around for other software to create your colored picture of "Mario."

I know that THE RAINBOW's review editor tries very hard to match reviews with people having the appropriate experience and interest in a specific subject. She hit the nail on the head with this graphics screen dump assignment. You see, in addition to having used a variety of screen dumps, I have written several of my own including a couple which work specifically with the CGP-115. Having gone through the exercise, I have a very good feel for what can be done with a software package like this.

CGP115SD is a simple program designed to reproduce color for color, dot for dot, a picture drawn on the graphics screen display of the Color Computer with the CGP-115. To reproduce a picture, it is first drawn on the screen or loaded into memory. Then, the screen dump software is loaded and run.

At start-up, there are a few simple questions to establish the color set, verify that the correct picture is in memory, etc. Then the dump to the printer starts. Up to this point everything is fine. From this point on, take your time coming back to check on the progress of the picture drawing. The screen dump takes a long, long time. Here is a quote directly from the instruction sheet provided with this program. "Depending on the complexity and the number of colors to be dumped, it will take one to three hours to dump one screen."

Working with the program, I will confirm this speed (or lack of), but I cannot agree with the next statement made in the instructions. "Because of the mechanics of the CGP-115 printer, this is as fast as it can be done." This is not an accurate statement. Although admittedly, the CGP-115 is not a fast printer, the problem with the lack of speed with this program is that it is written in BASIC. This is not the language of choice for a program requiring so much raw computation. A high resolution screen contains over 49,000 pixels to scan, the process takes a lot of time with BASIC. I ran a timing test on a solid color screen. To reproduce a single solid line the program takes twice as long to compute what is to be drawn as it takes to actually draw the line on the printer.

To add injury to insult, this program is overpriced. *CGP115SD* is selling for about twice the price of machine language screen dumps that are available for the Color Computer.

I think my bottom line is obvious from these observations. Don't bother with this program if you value your time and money. Life is too short to wait for three-hour screen dumps and a twenty dollar bill is still a lot of money to most people. The maturity level of Color Computer software is well beyond the sophistication of this BASIC program. Perhaps this would be a viable product if written in machine code and priced more competitively.

(Derby City Software, 3141 Doreen Way, Louisville, KY 40220, ECB cassette $19.95 plus $1.50 S/H)

— Tom Szlucha

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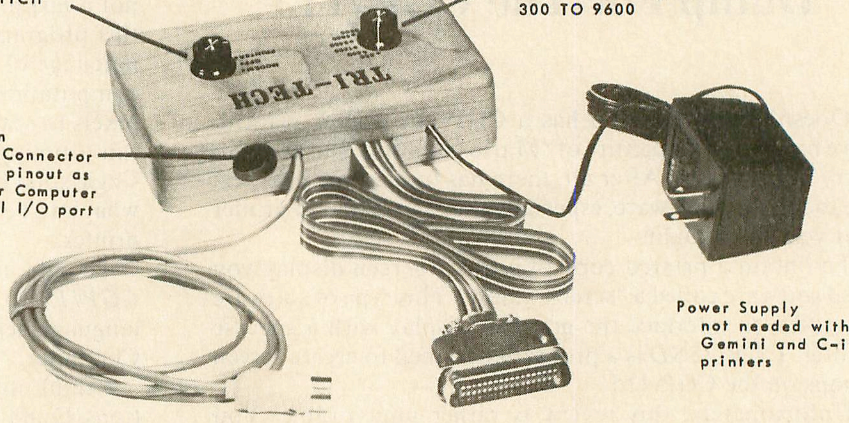

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Swiss Army Knife — A Sharp Disk Utility

Swiss Army Knife? Well, a catchy name, and appropriate. A Swiss army knife has many different blades to do many different things. The same with the program from The Dataman called *Swiss Army Knife*. It contains many different parts, each doing a specific function. *Swiss Army Knife* is a general disk utility program for the Color Computer written in position independent machine language code. It can be used with any Disk Extended BASIC formatted disk as well as some parts of a FLEX formatted disk. It is used to look at any byte on the disk and make changes if necessary.

Swiss Army Knife's commands allow the following: 'R'ead a sector from the disk; 'W'rite a sector to the disk; 'V'erify all or part of the sectors on the disk; 'M'odify the contents of any byte on the disk; change the number of the working 'D'rive if you have more than one disk drive (as well as change the number of tracks the program will recognize); display the 'H'exadecimal equivalents of the buffer used by *Swiss Army Knife* on the screen; 'S'ave the contents of the buffer being used into a secondary buffer for safekeeping; 'U'nsave the secondary buffer back to the primary buffer or display buffer; get the 'N'ext sector and read it into the display buffer; get the 'L'ast sector read and read it into the display buffer; and 'E'xit the program.

Read allows five different ways to read in a sector. A specific sector can be read in; a granule number can be entered, reading the first sector of the granule; a file name can be entered, reading the first sector of the filename, if it exists on the specified disk, and setting a special internal switch that allows the Next command to step through all the sectors of your filename; the first sector of the directory of the disk can be read in; or the file allocation table of the disk can be read in. The screen displays the ASCII representations of the bytes contained in the display buffer.

The program is easy to use if you are familiar with some of the workings of Disk Extended BASIC. For those not familiar, included in the manual is a tutorial on how the CoCo uses disks. It is well written and should be read by all users of this program. The rest of the manual is also well written and easy to follow.

When using the Verify command, the screen shows an ASCII dump of a sector on the top half of the screen (256 bytes) and the track and sector number, as well as an error code of the read operation on the bottom half. But the screen flashes with every sector read to rewrite all of the values shown on the screen. It would have been much nicer to leave the bottom half of the screen intact, updating only the appropriate numbers and changing the top half with every sector read. Also, it would have been nice to have used the BREAK key to exit commands back to the main menu in case a command was chosen in error.

The program is a nice utility but incomplete. For example, no hardcopy of anything is available. I have been in contact with the supplier, The Dataman, and they inform me that a new program is on the way that is much more extensive and includes the *Swiss Army Knife* program in its package.

Features versus cost make this program acceptable and a good utility to add to your library.

(The Dataman, 420 Ferguson Ave. N., Hamilton, Ontario, Canada, L8L 4Y9, $25.50 U.S., $29.95 Can.)

— Eldon Doucet

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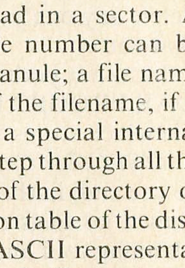

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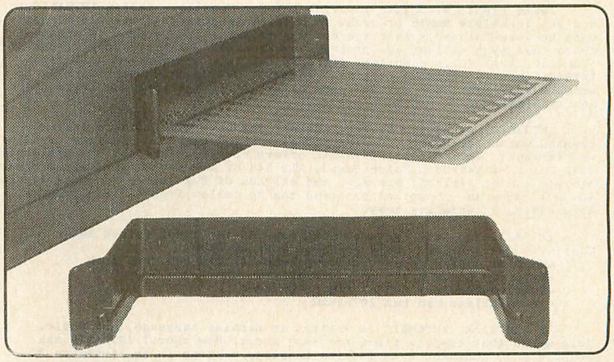

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Organize Your Time With *MSI Color Calendar*

When I first received *MSI Color Calendar* for review I was somewhat at a loss. A program to help keep track of appointments, birthdays, regular payments and such sounded like it could be very useful to most people, and as I had a couple of weeks to work with, the best way to test it would be to use it that way myself. The only trouble is that I am currently on vacation and I have few appointments to keep track of.

While pouring over a ground plan and complicated planting chart for the garden, the light dawned. An hour later the information was entered, and in the course of the next 20 plus days, the program proved to be a very useful planning tool.

MSI Color Calendar is designed to run on a 32K disk system with Extended BASIC. Using its own 42 x 32 screen display, it provides a clear and readable screen (of the sort we wish CoCo had). *Color Calendar* uses an interesting protection system as well, using a jack which plugs into the left joystick port. Internal circuitry, contained in a translucent block, gives a value to the joyport which is checked when the disk is loaded. If the jack is missing, the screen flashes and the loading sequence is interrupted. If you use joysticks, and have an installation such that it is difficult to get to the back of your CoCo, this might be a problem, but I had no difficulty and left the jack in for day-to-day operation.

BASIC COMPILER

Create Machine Language Programs from Basic Programs

Thats right, with this powerful integer Compiler, called INTBASIC, one can translate Basic programs to Machine Language. Those who do not want to learn Assembly Language can use this utility program to create those fast machine language programs every ambitious programmer dreams of creating. Even fully compitant Assembly Language programmers will find INTBASIC a very valuable utility. INTBASIC was designed specifically to produce efficient 6809 machine code by utilizing the powerful instruction set available.

INTBASIC, developed by WASATCHWARE, features all standard Basic command words including two-dimensional arrays, multiple commands per line and strings. In addition, INTBASIC offers commands that are not available with Color or Extended Color Basic. All 64k of RAM can be used for program storage and/or variable storage, and all 32k of ROM can be accessed within the m.l. program. Compiled programs can be called from a Basic program, thus making interfacing easy.

INTBASIC has many features that some of the lower priced Basic Compilers can't offer. Here are just some of them:
-No Disk system is required, although it can run from disk
-Extended Color Basic is NOT required
-Enables the full 64k of RAM to be used
-16k machines can run INTBASIC

In addition, INTBASIC is written in Machine language, not Basic. This means that compile times are very short. How short? INTBASIC can compile a 10 thousand byte Machine Language program in as little as 30 seconds!

Some other reasons to buy INTBASIC
-By converting Basic programs to machine language, program execution times are decreased by a factor of 50!
-Machine Language programs can perform many things that a Basic program cannot do. Unlimited possibilities exist when using machine language.
-Variable storage is efficiently allocated, and therefore large arrays may be used. For example, the integer array A(30000) is allowable on 64k machines.
-More than one program can reside in memory at once. As apposed to Basic which only allows one program at a time in the computer.
-System utility software can be easily developed using INTBASIC.
-Machine language programs that take pages and pages of Assembly Language source to create, can be created with less than a page of a comparable Basic source, when compiled with INTBASIC.
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A consequence of this form of protection is that Micro Services suggests making a backup of the program. A normal *BACKUP* routine provided a working copy and, except for a few initial entries, was the copy used for evaluation.

MSI Color Calendar comes with a well-written and complete, 10-sheet, 8½ x 11 instruction book. After the introduction page (which lists required equipment — 32K Extended BASIC, disk system, and optional printer — comes the main body of the text, which tells how to initialize the program on its first running, and gives a concise explanation of the calendar menu.

The main menu lets you choose from a number of options. The first is to INITIALIZE the calendar file; this must be done the first time the program is run and may be ignored thereafter.

LIST ALL ENTRIES gives the option to list all entries in the calendar, and to delete any that are no longer pertinent, or to return to the main menu.

DISPLAY CALENDAR puts a calendar on the screen for a month you designate, with a number on appropriate dates indicating the number of appointments for that day. The option is to print a hard copy, which has a listing of the appointments keyed to the calendar printed at its bottom. You may also return to the main menu.

ADD ENTRIES is the main menu option that allows entry of appointments by month, day and time, and provides for a 25-character comment line. To return to the main menu from here requires that an "EE" be entered as the first entry on a line.

DELETE ENTRY lists all entries and gives the option to delete any one by entering the sequence number specific to that entry.

Last, but perhaps most important, is the END CALENDAR PROGRAM option. This updates and closes the disk file which stores all entries.

MSI Color Calendar has proven to be easy and pleasant to use and, in the weeks I have been working with it, it has shown no bugs or flaws in its execution. As an excellent planning tool and daily reminder, it does all that is promised, and does it well — so well in fact, that prior to returning the package to my editor, I intend to run off my summer planting schedule for my file.

Now, when is that next square of radishes due for planting?

(Delker Electronics, P.O. Box 897, Dept. D, Smyrna, TN 37167, $19.95 plus $2.00 postage paid, or $3.50 C.O.D.; manufactured by Micro Services Inc.)

— Nevin J. Templin

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You'll Get A Bang Out Of *The Gunfighter*

As the wagon clears out you suddenly realize you're being ambushed. You reach for your gun, but it's too late. The other cowboy has his six-shooter drawn already. He shoots and you die. No, you are not in an old, old west shootout, you're playing *The Gunfighter*, a new release from Jarb Software.

The Gunfighter is a high resolution, arcade-quality two-player game written for a 32K Extended BASIC Color Computer. Joysticks are required for this game.

The scenario is as follows. You are the top gun in the territory, and life is just great, until "the kid" rides into town. He challenges you to a shootout and you accept in fear. You have to outdraw and outshoot the kid. You also have to dodge his bullets.

After you begin play, you can fire your gun. You will have only six shots, as indicated by the large bullets at the bottom sides of the screen. If you and your opponent run out of bullets before someone gets killed you both reload and get six more bullets. Every time somebody gets killed, that person gets a point. The first player that gets 12 points dies and loses.

You will see many things on the game screen, such as cacti, rocks, skulls, and covered wagons. You can shoot through cacti, but you can't run through them. Rocks will ricochet your shots and obstruct your movement. Skulls and the wagon absorb your bullets and block your path.

During a game if you want to restart, just push the Reset button. If you are not satisfied with the present screen, push the BREAK key and the computer will transport you to a new screen.

The instructions to *The Gunfighter* are fairly good and tell you the primary objectives of the game.

I think *The Gunfighter* is an above average game and it deserves four out of five stars. Meanwhile, have fun in the old west, and remember to shoot first and ask questions later.

(Jarb Software, 1636 D Avenue, Suite C, National City, CA 92050, $19.95 tape, $24.95 disk/Amdisk)

— Pat Downard

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Flying Tigers — A High-Flying Space Odyssey

Flying Tigers is a very good copy of the Defenders arcade game that has been around for some time now. The game is available on tape or disk from Sugar Software, and the instructions include loading on non-Extended or Extended BASIC computers. *Flying Tigers* is written in machine language and requires 16K for cassette and 32K for disk-based systems. If you buy the cassette version now and upgrade to disk later, you can get a disk copy by returning the original tape along with $5 to cover handling.

The documentation is nicely done, and put into book form. The instructions are very precise and to the point. The player comes away with all the knowledge he needs to play the game. The documentation includes diagrams of the main game screen and the movements for the joystick on the backside of the cover. Off to the top right of the main screen is a long range scanner showing us a long distance view of all the aliens and all our downed comrades.

Flying Tigers has five skill levels: Flying Lessons, Easy Game, Difficult, Challenging, and Impossible. The Flying Lessons level isn't really a game; it helps the player learn the feel of how the ship moves and the general feel of the game.

The real fun starts in level two (Easy Game). Here you have some time to move around and destroy the aliens, and each level increases the speed of the aliens, giving you less time to think before you have to move. You have at your disposal three ships and three Deathrays. By holding down the fire button, the the Deathrays will destroy all aliens on the main screen. Any not seen on the main screen will not be destroyed. The object of the game is to survive and kill as many aliens as you can.

The game includes extras such as a pause mode (by hitting the BREAK key), and a Deathray. You can always go back to the main menu during the game by hitting the Space Bar —this also has the effect of resetting the game. Pressing the CLEAR key will exit to BASIC, and when the game has come to an end, hitting the fire button will restart the game at the same difficulty level you just played. If you would like to advance to another difficulty level at this time, hitting the ENTER key will return you to the main menu so you can move up. A bonus ship and an extra Deathray are awarded for every 10,000 points. Score is given for each surviving comrade and destroying each alien.

My friends and I found that *Flying Tigers* plays better with the new Radio Shack Deluxe Joystick, but a good score and play can be accomplished with either of the joysticks. I have no complaints with the game. The instructions did have a few spelling errors though.

Good luck, flyers, and may you never run short of Deathrays.

(Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, 16K tape $24.95, 32K disk $27.95)

— Stephen M. Hess

A Well-Constructed Breadboard With XPNDR1 And SuperGuide

Attention, hardware hackers! Have you been contemplating an outboard ROM, or maybe an EPROM programmer? A nice looking, and well constructed, breadboard is available for your next project. Robotic Microsystems has introduced a product called the XPNDR1, a 5¾ x 4¼-inch breadboard that plugs into your ROM port. The unit is constructed of heavy fiberglass with plated-through hole construction and solder identification of bus signals. Gold plated connectors are used for connection to the CoCo.

A molded plastic guide, called the SuperGuide, assures perfect alignment when the XPNDR1 board is plugged into the ROM port. The SuperGuide is inserted into the ROM slot and holds the spring door open, preventing foreign objects from entering the ROM slot.

The board has several nice features. Each CoCo bus signal is extended to a plated-through hole that is labeled with its corresponding signal notation on the bottom of the board. Ample +5 volt and ground buses are provided on both sides of the board for Vcc and Gnd connections to the chips. Fourteen rows of .1-inch holes, 34 holes to a row, are available for mounting IC sockets and components.. A little elementary math produces the deduction that this is enough space for approximately 28 14-pin IC's. The rows are on .3-inch centers for standard socket mounting. Enough room is provided for any small projects we could envision.

For all of the good points there are corresponding drawbacks to the layout of the board. First of all, many holes do not have solder pads. This necessitates the use of wirewrap sockets for proper construction of circuits. By providing solder pads, alternate construction methods would have been feasible.

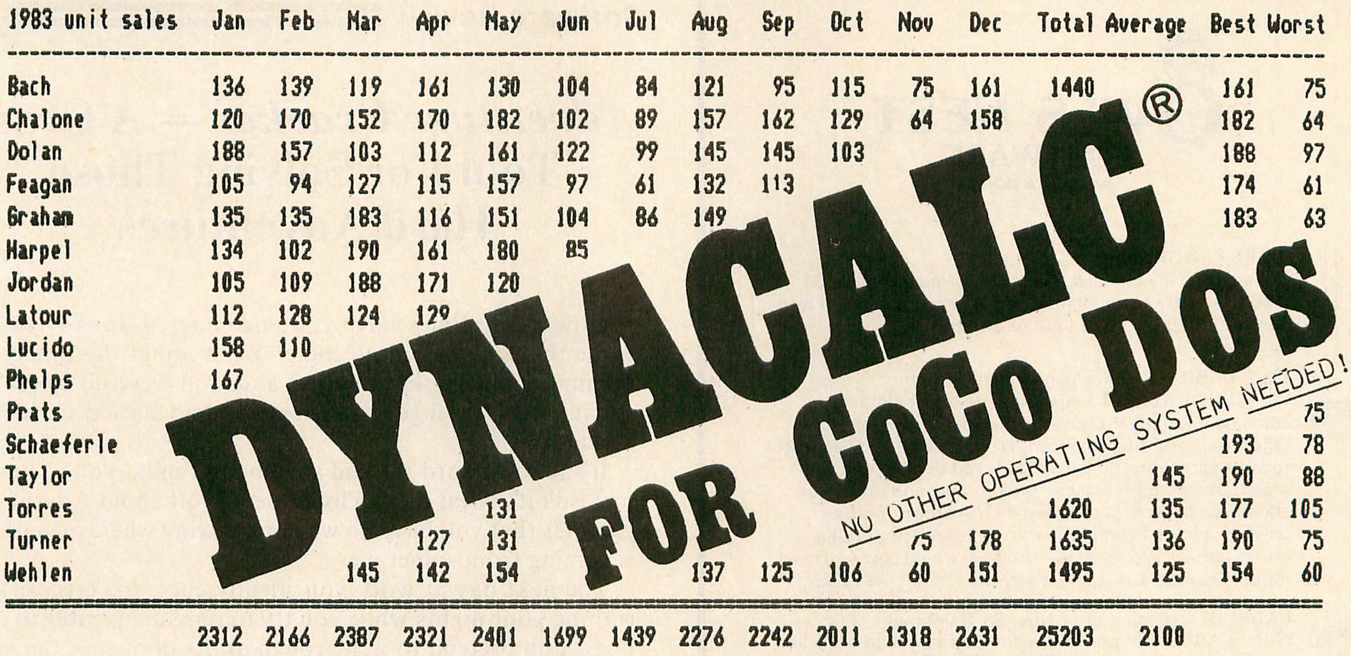
On the end of the board opposite the computer there are three rows of holes on .1-inch centers. This space was allocated for connectors for peripheral devices, etc. Other than the space I just referred to, space is limited on the board proper for "breadboarding." I suppose any components other than IC sockets would have to be wire-wrapped between the sockets.

Too much of the space on the board is allocated to bus expansion, as opposed to component mounting, in my opinion. Bus expansion occupies nearly 25 percent of the real estate. To the serious user, this is valuable space for components, more ICs, etc.

I would not recommend this unit for the above reasons. If the board were redesigned such that the above features were incorporated I think this would be an excellent product. As it is presently configured it makes construction tedious for some applications to say the least.

(Robotic Microsystems, Box 30807, Seattle, WA 98103, XPNDR1 $19.95 or two for $36, SuperGuide $3.95)

— Dan Downard



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Dolan	188	157	103	112	161	122	99	145	145	103					188	97
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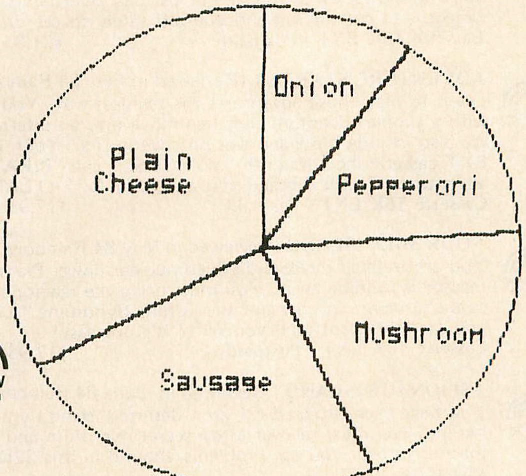

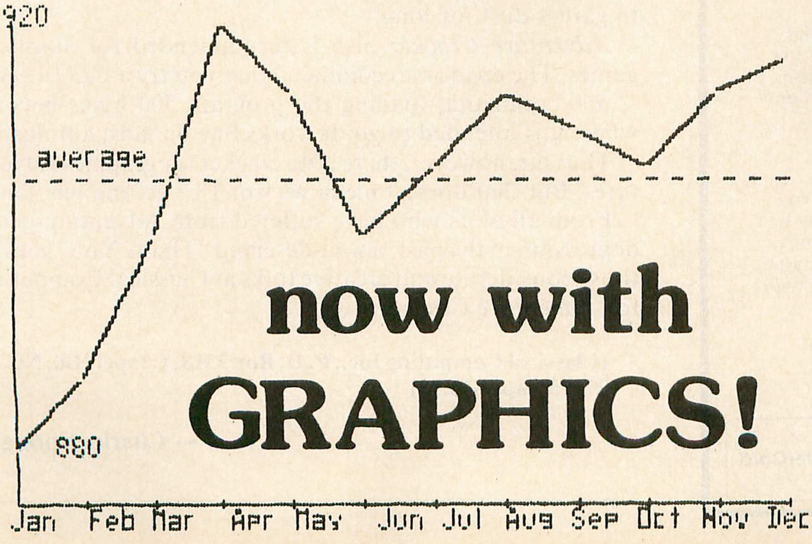

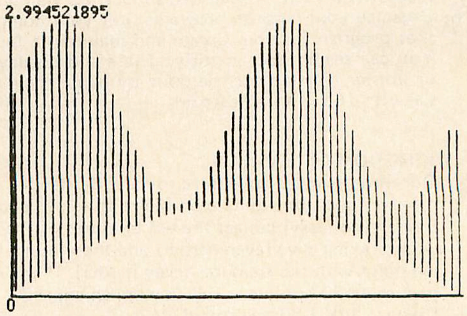

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Adventure Cracker — A Great Tool For Solving Those Hard Adventures

How many times have you encountered an Adventure game that just defied all logic? What about the time you hammered on the keys until 2 a.m. and were no closer to solving the challenge than when you had started six hours earlier.

It's kind of hard to read somebody's mind you've never met isn't it? What turns a lot of people off about Adventure games is that you have no way of knowing where an author is coming from sometimes.

The next day at work you silently curse the creator for ruining your nights while you try to remain invisible to the boss. You pretend to write rough drafts of memos but you are actually jotting down new commands to try when you get home, aren't you?

That night you make a little progress, but not enough to brag about. As the wee hours again approach, you throw up your hands in frustration and file the program, pledging someday when you have all the time in the world to get back to the Adventure.

Usually that time never arrives and the program sits in the file gathering dust. "Who needs that aggravation?" you ask yourself.

If this scenario is one you can identify with, you will greatly appreciate *Adventure Cracker*, a program created by Classical Computing of Chapel Hill, N.C., just for folks like us.

All you have to do is load (don't *EXEC* or *RUN*) it in the program you wish to examine. Then load in *Adventure Cracker* and type *EXEC 490*.

And whammo! All of the commands and responses are unveiled right before your widely stretched eyes. That's right, there is now hope for those old Adventure programs of which you can't even remember the names!

It's like the old saying about the weather in Kentucky: "If you wait long enough, you're likely to see anything." CoCo lovers are learning that the adage applies to them. There are just too many folks out there tinkering around for a problem to gather dust for long.

Adventure Cracker also is recommended for autoload games. The creators recommend that you try a *CLOADM" ", 500* command, loading the program 500 bytes beyond where it is intended to go. It works fine on most autoloads.

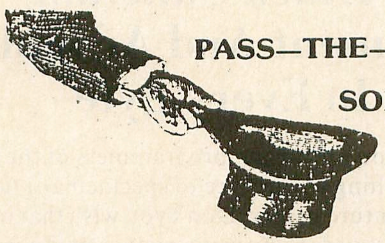
Thus far, however, there is no cracker for graphics Adventures. But that doesn't mean we won't be getting one soon.

From all of us who have suffered from Adventure-game depression in the past, a well-deserved "Thank You" goes to those considerate and creative folks at Classical Computing for *Adventure Cracker*.

(Classical Computing Inc., P. O. Box 3318, Chapel Hill, NC 27515, tape $14.98)

— Charles Springer

Free



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Since the computerized dictionary is expandable, you can customize it with your own pet words or technical terms, and can even develop specialized dictionaries for special uses or foreign languages.

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SPELL 'N FIX II is available on disk only. For tape systems, order SPELL 'N FIX I at $49.39; CoCo version for Flex or STAR-DOS disk operating systems costs $89.29.

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The Black Sanctum — Excitement And Adventure In Every Byte

As most of you are aware, programmers of the CoCo are just now scratching the surface of spectacular graphics, for instance, Adventure games. Don't you wish that in addition to the plain old words there was a picture of the scene? Your dreams have come true with Mark Data's Adventure game, *The Black Sanctum*.

As far as playing Adventure games, no word-type games were really good enough to keep my interest for very long. When I played this Adventure game I was glued to my TV set for hours. From the cold outdoors to the library inside the monastery this is a great game.

The Black Sanctum is a 32K high resolution 100 percent machine language Adventure game. After you *CLOADM* the program (which automatically executes), you will see either a blue or a red screen. If the screen is red you must push the Reset button until the screen is blue. If the screen is blue you can press any key and continue with the program.

The object of *The Black Sanctum* is to kill all of the black magic that lurks in an old 18th century monastery. This is no easy task. Of all the Adventure games I've ever played, *The Black Sanctum* seems to be the hardest. Every instrument is used in this game, so don't anticipate that an object has little or no use. Some objects can even be used two or three times.

The commands are unlimited in this game. All commands are two words, a noun and a verb. It is good to have a thesaurus with you to see if there is another word with the same meaning as the word you are using. The directions in the game are pretty skimpy and do not tell you a whole lot about the game. At the same time, the game is very easy to understand and play.

In my opinion this is a great game and it should get all five stars (on my five-star scale). Every scene is chilling from the hallway to the bishop's coffin. I recommend this game highly and Adventure game fans should not be without it.

(Mark Data Products, 24001 Alicia Pkwy., #207 Mission Viejo, CA 92691, $24.95 tape, $27.95 disk)

— Pat Downard

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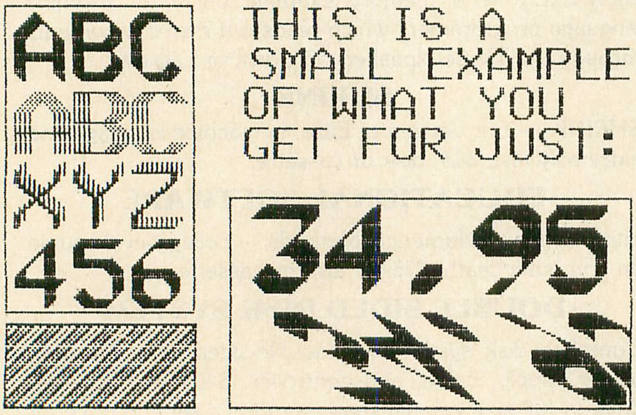

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DMAGIC: A Disk Utility — Tomorrow We Gotta Get Organized

Remember when you were still playing with tape storage and dreaming of the day you might get a disk drive? When you really believed that all that wonderful storage space meant you probably wouldn't require more than one or two disks for all your programs?

And now, my friend? You say you've got 27 full disks and no real idea of what's on any of them? You say you really don't feel like typing DIR and then playing the famous CoCo game of *SHIFT-@*? You say you could *POKE* and then *PRINT* out all of those directories, but then you still would have to go through them one by one to find what you wanted because the CoCo disk directory isn't alphabetized? And, to top it all off, you need to run a bunch of the programs anyway because you don't even recognize the filenames anymore?

Well, what you need is a utility to help manage those disks. There are a lot of them on the market these days, each with its own features and emphases; and one of the newcomers is *DMAGIC*.

RUN the program, type 'N' (for "new disk"), and put in the first disk you want to whip into shape. Let's sort the DIR listing. Just type 'S' and *DMAGIC* not only sorts the disk directory but also rewrites it on the disk in alphabetical order.

Want to take a look through the directory now? Simply push the "up" or "down" arrow, and *DMAGIC* displays one filename at a time, forward or backward, allowing you at any time to *LOAD*, *KILL*, *COPY*, or *RENAME* the program on display. It also will give you the hexadecimal addresses for machine language programs, and permit you to change drives, change disks or exit to BASIC.

Want a quicker view of the directory? Type 'P' and *DMAGIC* displays up to 26 entries at a time, with a red graphic block appearing in front of the current active file. Typing 'R' at any point returns you to the main menu.

A copy of *DMAGIC* on each of your disks (using *DMAGIC* to put it there, of course!) can go a long way toward giving you substantial control over that multiplying disk collection. While I personally would like to see addition of a *PRINT* function (to allow easier updating of a directory printout for each disk sleeve), *DMAGIC* is a good, easy-to-use utility and may prove to be exactly what you need. Its instructions are clear and straightforward. Although it will work well enough with only 16K, the author indicates 32K will mean exchanging disks a lot less often when you use the *COPY* function; the program takes about 5.8K of RAM. Single and multiple drives are supported.

So what's keeping you? Let's get organized . . . tomorrow of course.

(Dorison House Publishers, Inc., 824 Park Square Building, Boston MA 02116, 16K+ disk, $21.95)

— Warren S. Napier

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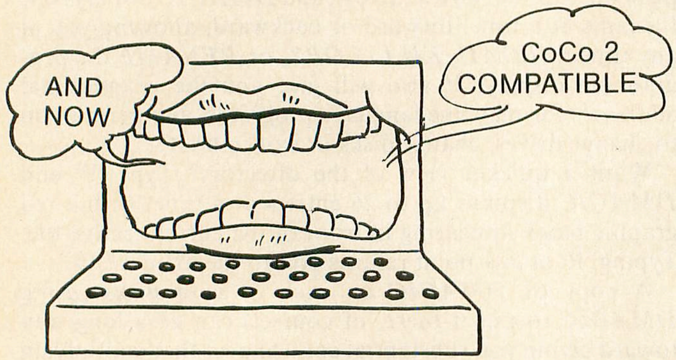

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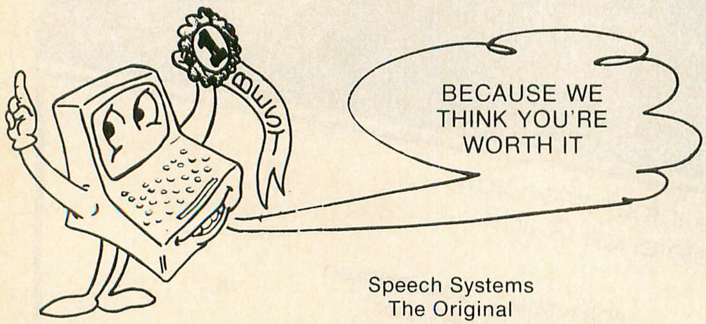
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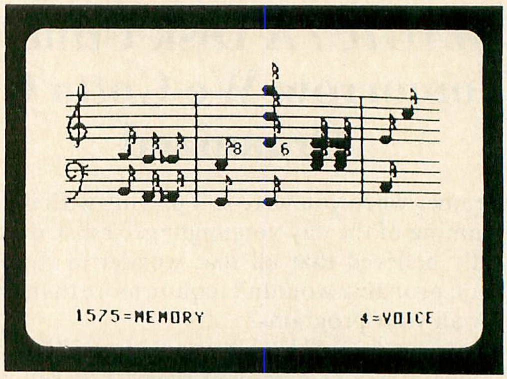
Phoneme Editor	Yes
Text-to-Speech program	Yes
Documentation	30 pages
Software	2 tapes
IC count	6
Case material	Aluminum
Case size	15/16 x 5½ x 4¼
CoCo 2 version	Yes
Expansion Unit Compatibility	
RS Multi-pak	Yes
BT-1000	Yes
Spectrum Switcher	Yes
Y-Pak	Yes
Y-Cable	Yes

NOTE: All software (except Termtalk) will work on either unit, so you can buy our software and their hardware or vice versa.



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Spectrum DOS: An Added Attraction For CoCo

By Ed Ellers

As soon as the hard-core computer nuts got hold of the Color Computer, the complaints started to fly. Some of them were even valid. "No error trapping!" "No lowercase!" "s-l-o-w disk I/O!" The CoCo's been around for nearly four years now, and Extended Color BASIC and disk drives have been with us for more than three years, so you can imagine that a lot of attempts have been made to fix what people saw as the machine's flaws. The number of lowercase boards, Hi-Res text drivers and other goodies on the market are testimony to this. *Spectrum DOS* is an attempt to provide many of the features desired by CoCo enthusiasts in a single program.

Spectrum DOS actually patches the Disk BASIC ROM program to add its new commands. For this you need a 64K Extended BASIC machine. The program can be supplied for whichever combination of ROMs your system has; the copy I used for test was set up for the "old" chips (1.1 Color BASIC and 1.0 Disk BASIC), and it caused a problem with the keyboard response on my machine (which has the 1.2 Color BASIC ROM) The DOS can also be burned into an EPROM, which will replace the Disk BASIC chip in the controller; the Hi-Res text feature and a few other commands will be lost unless you use a 16K EPROM (such as a 27128).

One of the strong points of *Spectrum DOS* is its ability to make use of faster disk drives as well as larger capacities. The Radio Shack (and TDP) disk drives used by most CoCo users have only 35 tracks, and are rated to go from track to track in 30 milliseconds (though they are actually capable of 20 ms operation). The drives that Radio Shack sells now (in white cases) are actually the same as the drives in the Model 4, and can use 40 tracks and step at 6 ms. Sadly, both the old and new Disk BASIC ROMs are stuck at 35 tracks and 30 ms operation.

Spectrum DOS has the ability to specify both step rate and number of tracks (35, 40 or 80), and you can use different settings for each drive. The system I'm using has one old Radio Shack drive and two Hitachi 3" compact floppy drives; these are 40-track and are rated by Hitachi to step at 3 ms(!). I have set up *Spectrum DOS* to run drive 0 at 35 tracks and 20 ms, and drives 1 and 2 at 40 tracks and 3 ms. The Radio Shack drive doesn't seem to be much faster, but, when the head has to move a great distance, it now does it in one smooth motion, so the grinding sound is pretty much gone. As for the Hitachi 3" drives, I had to guess at the correct setting for 3 ms operation (the manual only gives values down to 6 ms), and I don't know if they are actually going that fast; they do work well, though.

The setup procedure is done with a program called *SETUP/BAS*. This asks you how many drives are in your system, how many tracks for each drive, the step rate for each and the printer Baud rate you usually use. You can also select a prompt (the default is "READY" instead of the standard "OK") and a new cursor character. The cursor no longer changes colors, which should please quite a few people.

Spectrum DOS does have a good Hi-Res text driver, which gives your choice of 32, 51 or 64 characters per line (still 16 lines on the screen) and has a full ASCII character set with lowercase characters. The *PRINT@* command has been extended to the full numerical range of the mode you select. In *PMODE 4,* you can draw graphics over text and print text over graphics.

Another "key" feature is the programmable function keys. Any of the keys 1 through 9 can be set up to represent any desired command string. When you press the down-arrow key, an inverse 'F' will appear in the upper left corner of the screen; when you press a number key, the pre-programmed string is executed automatically.

The ERROR command lets you specify a line in the program where it should go in case of an error. For example, if you use an ERROR 1000 statement, any error (whether in the program or in an INPUT statement) will cause the program to go to 1000 instead of stopping. (On many other computers this is called ON ERROR GOTO.)

There are far too many other neat things in *Spectrum DOS* for me to describe in full; things like printer echoing, advanced BASIC line editing features, commands to boot OS-9 and FLEX directly and even a help screen! *Spectrum DOS* is certainly something to look into if you are getting tired of the constraints of Disk BASIC.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421 or Box 9866, San Jose, CA 95157, $49.95 plus $3 S/H)

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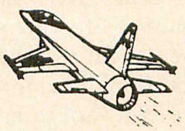

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Shrink For Extra Bytes

Have you ever needed extra memory space or had a BASIC program that was just a little too big to fit into your available memory? If so, *Shrink* by Elite Software could help.

Shrink is a machine language utility that removes unnecessary spaces from BASIC programs. The resulting code is still legitimate BASIC, which can be edited, run and saved. Unnecessary spaces are, in general, spaces around BASIC tokens. A few examples of some common reductions are illustrated below:

A = 1	becomes	A=1
GOTO 10	becomes	GOTO10
NEXT I	becomes	NEXTI
PRINT "A B C"	becomes	PRINT"ABC"
IF P = 2 THEN RETURN	becomes	IFP=2THENRETURN

Note that *Shrink* does not operate on strings like "A B C" or on comments like *REM THIS IS A COMMENT*. Since it is written in machine language, *Shrink* requires less than 350 bytes of storage and can reduce a 12K program in about 15 seconds.

Running *Shrink* is simple. After *CLEARing* space at the top of memory, *Shrink* is loaded into store followed by the BASIC program to be shrunk. *EXECing* the utility causes all the unnecessary spaces to be removed and the modified program may then be edited, run or saved. Using *PRINT MEM* before and after running *Shrink* shows exactly how many bytes were gained.

Shrink worked as advertised on every BASIC program I tried, yielding an average space savings of 10 to 25 percent. Of course, the amount of savings you get depends on the amount of white space in your code. As a last resort, comments can also be removed from the BASIC source to free additional memory. If you write much BASIC code, *Shrink* is a useful tool to have.

(Elite Software, Box 11224, Pittsburgh, PA 15238, $14.95 tape, $17.95 disk)

— Gary E. Epple

Cocoindx — A Convenient Index To CoCo's Literature

Cocoindx is just what the title might lead you to believe — a rather complete printed index of articles which have been written for and about the Color Computer.

There are 70 pages of listings of articles about the CoCo in this spiral-bound book. The index covers 13 publications including: *68 Micro Journal, 73, 80 Micro, Hot Coco, 80 U.S., Basic Computing, Byte, The Color Computer Magazine, Color Computer News* (now defunct), *Computers and Electronics, CQ Magazine, Ham Radio Magazine* and THE RAINBOW.

At first I had some doubts about the usefulness of the product, but the day it came, I had a chance to use it for a good purpose. I wanted to go back to the source article for the program I have for printing custom statements. I knew it was in one of the pile of magazines in this CoCo-nest, but I did not know exactly where.

I looked in *Cocoindx* and *voila*! There was the listing of Ron Garrett's program on Page 36 of the index. Now, finding the November 1982 RAINBOW in this mess — that's another matter.

The index file is set up with fields for Type, Magazine, Article name, Author, Page, Language, System and Notes.

The notes are a brief key to what the article is about. The rest of the fields should be self-explanatory.

The type of article is an abbreviation for which there is no key printed. The types are easy to understand, but I was fooled at first by the name SPEC, which I thought referred to articles about Spectaculator. I now suspect it means "special."

I appreciate the work which Dean Norris put into this very useful book, but I think the price is high. I know the cost of printing. I know the effort which must have been made in the project, but I can't help thinking CoCo-nuts may not be willing to shell out $20 for an index.

(Cocoindx, P.O. Box 23654, Tempe, AZ 85282, $19.95)

— Howard Lee Ball

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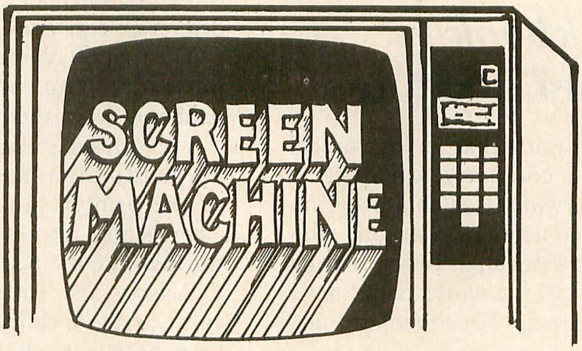

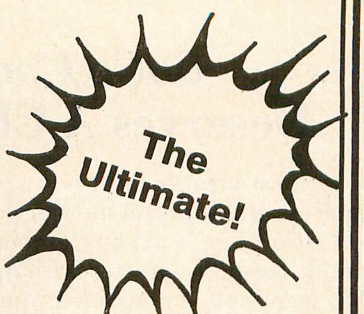
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CoCo Cookbook Deserves A Chef's Salute

It's nice when you discover a program that serves a useful purpose in addition to showing your computer's capabilities.

CoCo Cookbook, by Computerware, is such a program and it should be greeted with open arms by everyone who has spent hours fumbling through kitchen drawers, sorting index cards, and wondering what in the world could have happened to Aunt Bessie's age-old recipe for chocolate marble cake.

For those who collect recipes like some computer fanatics who seem to collect programs, *CoCo Cookbook* will be quite a catch, containing 50 delicious-sounding delectables that will be among the treasures in your collection. Are you ready for Oxtail with Herbs, Hunters Chicken Wings, and Deviled Beef Bones? Or, how about Lobster *a l'Americaine*?

I personally enjoyed Chocolate Devil's Food Cake, a traditional favorite that my wife prepared for the family using the recipe included in the program. It provided a definite twist from the normal review process.

Of course, the real value of *CoCo Cookbook* is the ability to store your own recipes, enabling you to once and for all rid yourself of that endless assortment of paper scraps that hinder the housekeeping process.

CoCo Cookbook will store up to 270 recipes on a single disk using a special compression technique with up to 3,040 characters per recipe, including title, ingredients and instructions — all in "free form" format. You don't have to take any shortcuts to conserve space either — thereby preserving those precious personal touches so necessary for the perfect dish. You can write and write and write, it seems.

The first 50 recipes in the program are provided by Computerware. You can keep them or delete them, but you'll probably want them.

You can access each recipe by title, number or by a special keyword search. You can list the ingredients to the screen or to the printer simply by using the Find Recipe option. There's also an automatic option that allows you to page through the recipe at your own pace.

Recipes also can be called up alphabetically or numerically, and you can keep a printed index file handy that lists them both ways should you forget how you entered a recipe, making it easy to retrieve the needed file.

Sorry, you folks without disk drives and with only 16K; *CoCo Cookbook* does require a disk and 32K.

The program is definitely user-friendly, making a complex filing job very easy. It also is fun, a real showpiece during parties, and very practical. If Mom still needs convincing about the value of your computer and its relevance to the home, *CoCo Cookbook* will do the job. The difficult part for her will be finding all the recipes she wants (or wants you) to file. Once you've got them all on disk, Mom's days of searching are over. A touch of a few keys will produce that priceless recipe in print in just a few seconds. Be warned, however, it's so easy you may wind up over the stove!

(Computerware, P.O. Box 668, 4403 Manchester Avenue, Suite 102, Encinitas, CA 92024, disk $27.95)

— Charles Springer

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Hint . . .

Amazing Graphics

Here is a program your readers might enjoy:

```
0 DIMA(39,40):SCREEN1,1:GET(0,0)-(255,191),A,G
1 PUT(0,0)-(255,191),A,NOT:GOTO1
```

Before it is used, however, a picture must be on a Hi-Res screen. When it is in memory, type *NEW* and enter the program. Type *RUN*, ENTER and wait a few seconds. Amazing! The key to this program is the statement *not* in Line 1. If a point is *PSET*, it *PRESETS* it and *vice versa*. Try this: while the computer is *PUTting* it on the screen, press the Reset button in back. Now type *RUN* and ENTER again. What do you think will happen?

Mark Raphael
Englishtown, NJ

Ice Bird Is A Fun, Heart Warming Game

Every once in a while a game is introduced that, while not completely original in concept, generates a new kind of appeal.

Ice Bird, while very similar to another game called *Ice Master* but not as fast or difficult, easily overcomes anything resembling redundancy with its charmingly quaint graphics.

The hero of the situation is a cute little blue penguin, complete with vest, who desperately but slowly waddles about in his efforts to avoid being killed by menacing pursuers equipped with deadly stingers.

There is also an assortment of blocks of ice, which Ice Bird uses to defend himself against the stingers. The object of the game is to connect three diamond blocks in a row before running out of blocks of ice.

A quaint element of suspense is added as seemingly innocent blocks suddenly start flashing, just before being transformed into pursuers of our hero. To destroy a pursuer, Ice Bird must hit it with a sliding block of ice or crumble the flashing block before it hatches.

Strange thing about those pursuers: They seem to vary in intelligence so you really have to be on your toes. They will live up to their names.

Players earn 1,000 points when all diamonds are connected. If none of the diamonds are touching a wall, an additional 1,000 points are awarded. If they are in a straight line, another 1,000 points are yours. If both of the latter are true, there's an additional 1,000 points. You can earn as many as 4,000 points on one turn.

The remaining blocks of ice are worth 100 points each. A crumbled block is worth only 10 points, but crushing a flashing block is worth 400.

There are several maze levels, each unique in its design and level of difficulty. Every third maze is a bonus maze.

Ice Bird is so cute that you tend to identify strongly with this little character. You will find yourself pulling the toggle switch frantically in order to protect him from harm.

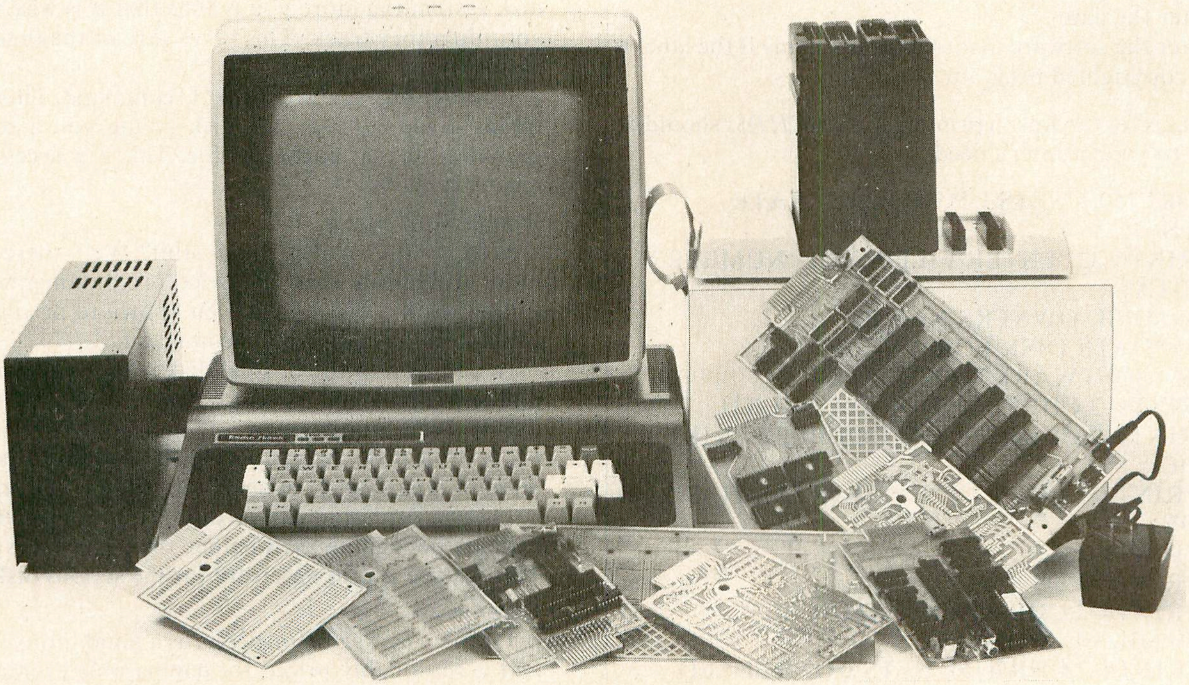
If things really get desperate, you can push the SHIFT '@' combination to "freeze" the action.

One or two players can play, and the scores, including the high total in the current series of games, are displayed at the top of the screen.

I really enjoyed *Ice Bird* and I believe the character is so likable that he could be put in a series of arcade challenges. That's one aspect of computer games that we have not seen and it could be a winning concept. If Bugs Bunny could be in 2,000 or 3,000 cartoons, why couldn't an Ice Bird or another character do the same thing?

(Crystal Software, 6591 Dawsey Road, Rock Creek, OH 44084, tape $24.95; disk $28.95)

— Charles Springer



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Software Review

The Sector Inspector — Good Disk Utility With A 'Zap'

I think one of the most unusual terms in computerese is "zapping" a disk. If someone out there knows the origin of this term I would sure enjoy hearing about it. As most of you are aware, we use the term "zapping" to mean altering the contents of a disk, on purpose of course. There are several programs on the market that perform an adequate job of zapping, including *The Sector Inspector*, by Sonburst Software.

The Sector Inspector is a disk maintenance utility that is menu driven and very user friendly. It is written in disk BASIC and machine language requiring no other equipment for proper operation. A 50-page instruction manual can be described as adequate. It contains a good explanation of all commands along with 21 examples of the program's uses. One section is devoted to common questions about disk systems in general. The programs are not protected and can be backed up for those who so desire. The original disk contains several copies of the main program in case of problems.

A BASIC loader program can be user modified for use with disk drives with faster step rates. Instructions are also given regarding the default printer Baud rate and how to add line feeds after carriage returns for those of us with printers requiring line feeds. My standard printer driver worked fine, though.

A main menu is invoked by *RUN"SI"*. Eight choices are available as follows:

D — Directory Menu
R — Rough Stuff Menu
O — Default Drive
M — Multiple Drives/One Drive
B — Change Printer Baud Rate
V — Verify On/Off
K — Key Click On/Off
C — Disk Backup

Directory Menu

The Directory Menu allows reading information from Track 17. Several different options are available in addition to just reading the directory. One command allows you to alphabetize your directory. This can be a real plus for a disk full of programs. No longer do you have to search through every program name to find that certain one you're looking for.

Two commands in this menu are the heart of the directory system. 'S' and 'R' save and retrieve the directory from Track 17 to/from Track 34. The more you use the CoCo disk system the more you realize that it is wise to back up your directory track. This takes care of the function automatically, or close to it.

Another nice feature is the 'T' command. This command tracks a file through the disk giving you a sequence of granules for that particular file. This is a necessity for file reconstruction.

Rough Stuff Menu

Why do they call it rough stuff? Well, there is nothing more dangerous than a novice programmer with a disk zapper. Entire disks have been known to disappear by the careless use of a disk write command.

In addition to the normal disk read/write commands, a disk scan command is included for verifying the integrity of a disk. This is the easiest way I know of to find a destroyed track on a disk. After finding the bad sector(s), you can attempt repairing them using the read/write commands.

Disk information can be dumped to a printer in several formats depending on whether the program is tokenized. This feature is also necessary for the serious disk zapper.

Comments

I think *The Sector Inspector* is a good utility for zappers and is reasonably priced for comparable programs. I suppose this is a moot point for normal programs, but it would be nice to be able to read more than 18 sectors on a track and 35 tracks. Sometimes there might be something there. You never know until you look.

(Sonburst Software, 233 E. Rogue River Hwy., Grants Pass, OR 97527, disk $29.95)

— Dan Downard

Hint . . .

Handy Label Printer

I simply got tired of seeing the hand written labels on my disks. Some were very sloppy, and some were in different colors of ink. The following is a short program that will print out a nice looking disk label. You can use gummed labels that will feed through your printer or simply print them out on regular paper and then cut them out and, using a "glue stick," stick them on your disks.

Edit the following lines:

50 enter your name
60 enter the date
70 enter the software manufacturer's name if the label is for a copyrighted program.

Format is for the Epson printer, and all *CHR$s* should be changed to your printer's needs.

```
10 POKE150,1 'SETS UP 900 BAUD RATE
20 CLS
40 PRINT@32,"ENTER FILE NAME/NUMBER"
:INPUTA$
50 B$="DISK OWNERS NAME"
60 C$="DATE DISK FORMATTED"
70 D$="SOFTWARE MFG'S TITLE"
80 PRINT#-2,CHR$(14); 'DOUBLE WIDTH
90 PRINT#-2,CHR$(27);"G"; 'DOUBLE STRIKE
MODE
100 PRINT#-2,CHR$(27);"E"; 'SETS EMPHASIZED
MODE
110 PRINT#-2,A$
120 PRINT#-2,D$
125 PRINT#-2,CHR$(27);"F"; 'CANCELS
EMPHASIZED MODE
130 PRINT#-2,CHR$(15); 'SETS CONDENSED
MODE
140 PRINT#-2,B$
150 PRINT#-2,C$
160 PRINT#-2,CHR$(27);"e";CHR$(1);CHR$(4); 'SET
HORIZONTAL/VERT TAB UNIT
165 PRINT#-2,CHR$(11) 'VERTICAL TAB MODE
170 CLS:GOTO40
```

Barry L. Baker
Pacific Beach, CA

Grobot An Education Game That Grows On You

Grobot, by Children's Computer Workshop, at first glance appears to have little or no educational benefit; it plays like a game, it looks like a game, and it sounds like a game. Kids think it is a game, but it is supposed to be educational. This is the best part of this program. The game is intended for children 10 to 13 and requires careful planning to attain high scores.

This program is very professional and very well thought out from start to finish. First the documentation is clear and concise with color and illustrations that really look like the computer screen. It covers everything from turning on the computer to thought-provoking questions in the back of the book to aid the child in realizing what the game is all about.

The game loads and runs with no hitches and there is a backup on side two of the tape. The game itself starts out by asking the player to pick four plants to grow and supplies a weather forecast. The planet of Kaldasian on which our farm is located has four different climates. The climate determines which plants grow best and the point value for each. There are 16 different plants to choose from, each with its own good and bad qualities. We are aided in making this decision by an almanac in the rear of the book. This is a simple cross reference chart of point values for each plant in each climate. To further complicate things, some of the point values are missing and must be obtained by the player during game play.

Once the crops are chosen, all that is left is harvesting in our harvester, right? Wrong! As with any farm, there are pests to be disposed of. The farming is done on the CoCo's Hi-Res graphics screen using one joystick. As the fun begins the Grobot is hovering above his field in his harvester. Soon the crops begin sprouting and making their way up the screen. The object is to wait until the plant blooms and pick the bloom to score points. As the plants get taller, below the ground's surface the Verms begin to appear and munch on the plants. You must make the Grobot jump out of the harvester and chase them away so you can go back to the harvester and pick blooms.

The action starts out slowly and builds with the points. As the plants start to bloom, they attract flying insects called gnats, which go straight to the blooms and must be chased away by moving the harvester to the plant. To pick blooms, move the harvester to the plant and push the fire button. The bloom only lasts a short time, so you must be fast. When the power runs out, the game ends. The game begins again with another weather forecast and the chance to select new crops.

Overall this is an excellent educational game, just what I would expect of a subsidiary of Children's Television Workshop. This game keeps the attention of the children and allows them to develop their skills at planning and problem solving. It is the best educational program I have seen so far.

(Radio Shack stores nationwide, Cat. No. 26-2527, 16K ECB, tape $19.95)

— James McCracken

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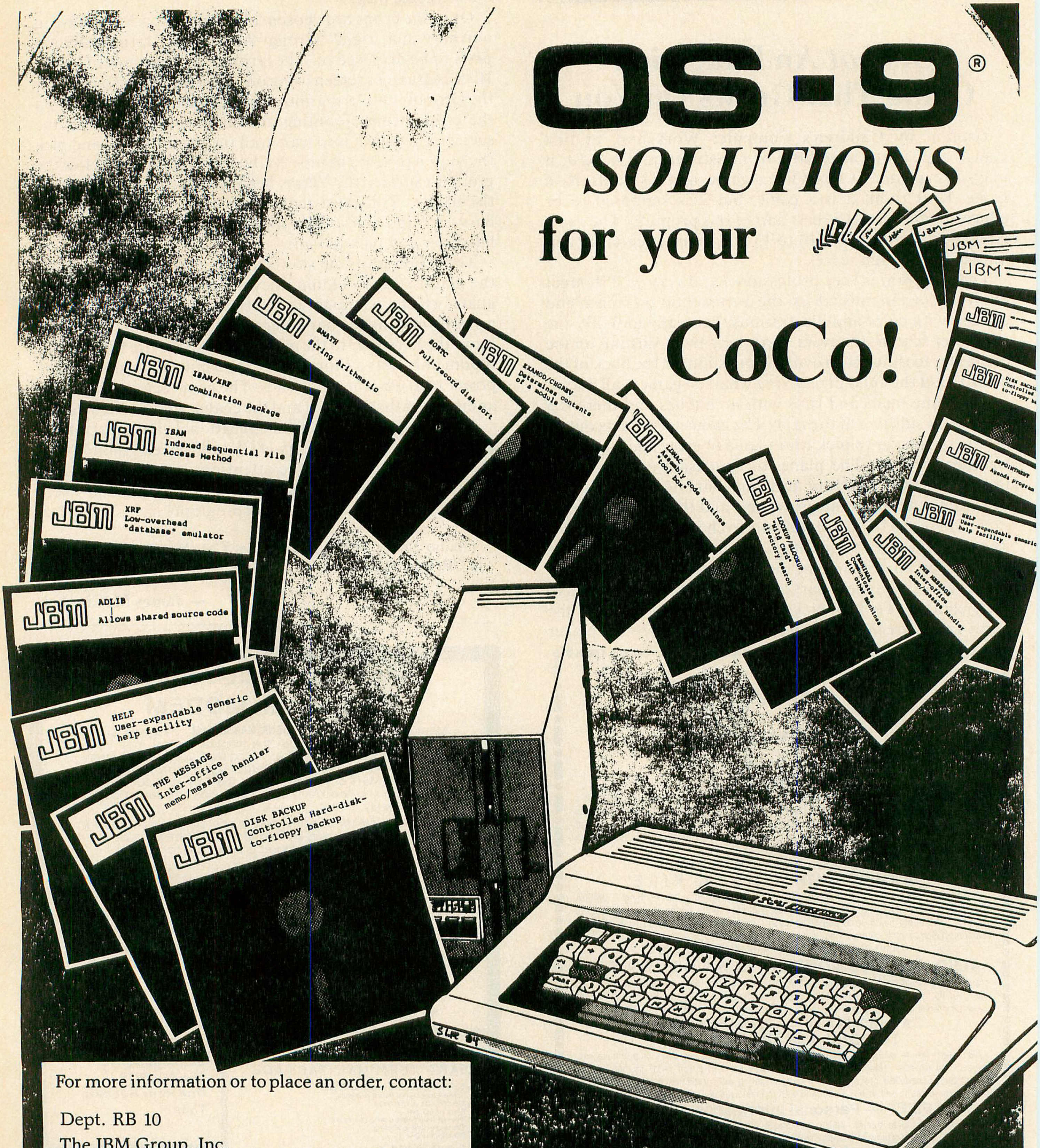
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Plotting Your Highs And Lows With *Super Color Biorhythms*

Super Color Biorhythms, from Armadillo International Software, is a small program written in Extended BASIC with a machine language graphing routine.

Some claim biorhythms are "biological rhythms" that begin at birth and continue regularly through life. I am not going to make any statements in this respect. I have been asked to review this program and I will restrict my comments to the performance of the program and the documentation that accompanies it. Incidentally, Armadillo International Software also makes a disclaimer in this respect.

Super Color Biorhythms is very easy to use. The package, on cassette tape, actually consists of two programs. The first one, called *Biorhythm,* is an Extended BASIC program which is loaded in the usual way. After running *Biorhythm,* a machine language routine called *Graf* automatically positions itself in memory, and everything is ready to go.

The first screen requests the basic information required for the program; that is, your birthdate, the beginning date for the chart and the number of days desired.

The plotting consists of three sinusoidal wave functions with periods of 23, 28 and 33 days in three colors; yellow, blue and red. The curves are labeled with color lettering at the bottom of the graph. The high resolution sine curves are plotted on a grid, representing days. At the top of the chart the date changes as the curves are drawn. You can halt the disply with SHIFT‘@’, and pressing any key will resume the plotting.

The program will display graphs for periods ranging from one day to 1,500 days, with the screen holding the plots corresponding to 14 days simultaneously. As the curves reach the right edge of the grid, the display scrolls to the left, permitting subsequent days to be plotted. This is a very nice touch.

The documentation is adequate. The four-page booklet contains all the necessary information to run the program and includes some explanation on the interpretation of the plots, something I said I wasn't going to touch. If you think biorhythms have any validity, this program will nicely plot your "cycles" for you.

(Armadillo International Software, P.O. Box 7661, Austin, TX 78712, tape $10.95)

— Dr. Carlos Calle

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Lancer Is A Contest Of Avian Agility

You are in the middle of a fierce combat in the skies. Your steed pivots, climbs and dives to meet the enemy and to better him. You use an outcropping of rock to hide from the enemy above and to position yourself to drop on an unsuspecting foe. You dive and nail your opponent only to have several of his comrades drop on you. This is just one of many possible outcomes in this Joust-type arcade game.

Lancer plays much like the description above. Your player is a knight with lance mounted upon some large bird of prey. Flying your mount is accomplished by hitting the fire button of your joystick. The faster you hit the fire button the faster your bird flies. Your opponents are equally armed and mounted. Your purpose is to stand and defeat all oncomers as wave after wave of enemies are sent after you. To kill the other riders you must run into them from a higher level of flight, or get the drop on them so to speak. If you attack the enemy from below, your knight will be killed even if you think you are on the offensive. When you dismount an enemy, his life force will be transformed into a white ball which will drop to the ground. If left alone, the life force balls will be reincarnated into new riders and new mounts will come and pick them up. The reincarnated riders are smarter and more agile fighters, so it's better to take care of them before they hatch. The white balls can be disposed of by running into them from any direction. The field of combat is composed of several "floating islands" or rocky outcrops. These are good both for maneuvering around and resting on when your trigger finger gets tired. Part way into the game the bottom of the screen turns into a lava pit, which is definitely not a place to land. Finally, to make the array of obstacles complete, there is the dragon — an almost unbeatable foe.

Most of the types of scoring in *Lancer* are covered above. You get points for dismounting your opponents, for disposing of the life energy balls and for defeating the dragon. In addition to this, you can get bonus points for survival in the single player game and for player cooperation in the two-player game. *Lancer* has 16 increasingly difficult levels from zero to 15. In the lower levels your mount moves slower and the other riders are slower and less aggressive, also the dragon doesn't appear quite as often. The change in difficulty between any two close levels, such as level six through eight is hardly noticeable. The difference becomes much more apparent if you jump from the lower five levels to the higher five. The game, at all levels, is divided up into waves. A wave starts with a title and a message announcing what bonus points are available, then the enemy riders start appearing. A wave ends when all present enemies have been destroyed. As *Lancer* progresses, more riders are sent with each wave. The dragon also appears more frequently in later waves of a game.

Lancer rates high in "playability" as an arcade graphics game for several reasons. It can be played as a two-player game. Each can fly their mounts at the same time. Both have the option of cooperating against the common foe or fighting against each other. *Lancer* provides incentives, in terms of bonus points, for both of these strategies at different times of a game. The speed of the game is good, though this is not at first apparent. The players are a little slow in responding to the controls, both for flying and running along the ground. This means you have to flap your wings harder to get going. Once you get going, however, you move along at a pretty good rate. It also takes an equal amount of work to slow down once you get going. This slight slowness in response doesn't really detract from the game, instead, it adds more to the strategy as you have to think ahead of what you are doing.

There are only a few things I didn't like about *Lancer*. In later game waves as more riders are sent at you there is a noticeable slowdown in the action. This is not all that common an occurrence, so I don't see it as a very serious problem. The only thing that really bothered me about *Lancer* is that there is no squealing brakes sound as the mounts are pulled to a halt. This is more a problem with me than with *Lancer*, as I'm used to the arcade game that *Lancer* is based on.

The graphics in *Lancer* are some of the best I've seen in a machine language arcade game. Shape movement is very smooth with little or no detectable flickering. The animation of the birds flapping their wings is also handled well — the players and riders looked like they are flying. The shape of the player and enemy riders is such that they actually appear to be knights mounted on large birds. The sound generated with *Lancer* is not spectacular, but is adequate and well suited to the game.

The documentation received with *Lancer* is short, but more than adequate. The documentation includes loading instructions, a short description of how to play *Lancer*, and how to contact Spectral Associates if you have any problems. *Lancer* is provided on copy-protected media. Replacement tapes and disks are available at a reasonable price.

Lancer is a high quality machine language game. This unique style of game has been one of my favorites in the arcade. Compared to games of equal quality, *Lancer* is competitively priced. I would recommend this game as a good addition to any serious video gamers software library.

(Spectral Associates, 3418 South 90th Street, Tacoma, WA 98409, 32K RAM, joysticks, Extended BASIC *not* required, $24.95 cassette, $28.95 disk)

— Richard D. Uglum

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Ever wonder what it would be like to work in a candy factory? The aroma alone would have to be among the employee benefits, especially if a lot of different kinds of goodies were produced there.

The down side of the equation would be coming home from work all sticky faced and a few pounds heavier every day if you couldn't resist sampling the delicacies.

After a few weeks or months, however, you would risk getting burned out on so much sugar intake, start taking your diet seriously and yearn for some other distractions.

That's exactly what you get in *Candy Co.*, a recent release from Intracolor that turns the factory into chaos as a bunch of bad guys invade trying to kidnap Q.P. Doll, your partner in this mouth-watering escapade. As Candy Dan, you've got to rescue Q.P. while keeping productivity levels up to meet the demands of your customers.

There are seven different types of candy that you must pick up on constantly moving conveyor belts, which move horizontally and vertically across the screen. If you pick up all the candy without losing a "thinking cap," your current frame (there are 1,000 frames of increasing difficulty in the game), number is multiplied by the level of difficulty (from one to 10) and then added to 100 to compute bonus points.

Individual point values for collecting jelly beans, bubble gum, candy canes, lollipops, chocolate bars, soda pops, and double dip cones.

Look out, though, because you could accidentally pick up a cherry bomb, which probably has been placed on one of the conveyor belts by one of the three bad guys—Phoodin Drog, Korprut Spy, or Pyro Wurx.

Drog is there to steal greedy units, the really sticky stuff. He will try to knock you off the conveyor belts.

Mr. Spy's mission is to steal the secret formula for an Invent Oid, a device that gives you and Q.P. Doll super powers.

Wurx is around to help out the other villains and the most likely suspect to have planted the cherry bombs.

There also are a couple of fellow workers, Doc D. Kay and M.C. Squared, but they are not much help, just riding around on conveyor belts. Doc is the designer of the greedy units. M.C.'s contribution is the invention of the Invent Oil, which enables you to knock the bad guys off the conveyor belts.

Of course, you and Q.P. Doll are never safe in *Candy Co.* because the object of the game, as in many arcade-type challenges, is to collect as many points as possible. If you are doing exceptionally well and want to take a break, you can pause by pressing the Space Bar.

The opening of the game includes some nice graphics effects and even a vocal announcement of the upcoming game. Unfortunately, you have one of those "If the square is red, press the Reset button until it is blue" nuisances that will try your patience because it sometimes takes several attempts to get the right colors.

The game also includes the ability to save high scores, which you almost expect these days, but there's already an incredibly high total on the board that will require a lot of games over several days to surpass.

I personally found the game a little monotonous, but my eight-year-old son seemed to be fascinated with it. Of course, there are several years separating our appreciation of arcade games. It definitely offers a high level of continuing challenge and if that's your bag, you'll probably enjoy it.

(Intracolor Communications, P.O. Box 1035, East Lansing, MI 48823, tape $34.95, disk $34.95.)

— Charles Springer

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Chopper Strike A Bit Too Rough

Only minutes into my first session with this game, I knew that I was going to have trouble with the review and I've had trouble with it ever since. I've come to see how inherently impossible it is to write an objective review on a program that is strictly entertainment. The facts are few and not very informative; the rest has got to be very subjective opinion. And, as we can all attest, different opinions in this world will often range light-years apart. So with this very important fact tucked away, we can now see what MichTron's arcade-graphics game, *Chopper Strike*, has to offer.

Chopper Strike is a helicopter attack-style game (obviously enough) that requires one joystick and either 16K or 32K of RAM. Both versions of the program are available on disk and cassette and are — as usual — copy protected. MichTron claims there are 105 different screens in the 32K version. Frankly, I lost count.

Chopper Strike is what I think of as an "endless loop" game: one where the action is continuous, the screen changes are subtle, and there is never a pause in sight. As you fly through enemy territory, your targets are oil tanks, gun turrets and ICBM launchpads. The oil tanks make nice easy targets, but the guns and the ICBMs shoot back. Among the enemy emplacements your own men can be seen, waving their arms to be picked up. When you rescue 20 of them by coming in contact with them, you gain 10,000 bonus points and another ship. But if you accidentally shoot one of them, you destroy yourself as well.

After you reach the 5,000 and 10,000 point marks in the game, horizontally flying missiles begin trying to blast you out of the sky. These cannot be destroyed, only avoided. And by this time you will have entered the underground fortress screens where your men can be seen between the same enemy emplacements, but now in underground caverns with wall clearance only pixels beyond your chopper blades. There can be no doubt about this game being challenging.

In order to form a better opinion about this game, I pulled three of the other popular chopper games from the archives and gave them a whirl. I have to say that I found *Chopper Strike* vastly superior to two of them and at least modestly superior to the other. That, by no means, means that it's perfect though. It could well be only a reflection on the others.

An aggravating thing that I found while playing *Chopper Strike* is the manner in which the screen scrolls. As it scrolls from right to left, it jerks across the screen, and I can see no reason for it. It affects not only the terrain, but control of the chopper as well. If it was done for effect, then someone must have been *very* misguided into believing that the terrain jerks by when you're in a helicopter. In truth, the choppy motion and the continuous choppy sound tend to turn 30 minutes of *Chopper Strike* into a three Excedrin headache.

Another forgettable feature of *Chopper Strike* is the two monitor fields in the upper-right corner of the screen. One is a three-position indicator that shows which direction your gun is currently pointed and the other is a field that flashes a representation of whatever it is that happens to blast you out of the sky. Both border on being totally useless. You know what direction your gun is pointed because your ship will be traveling in that direction and you would have to fall asleep at the stick not to notice what hit you. Gadgets and gauges don't hold the interest very long if they don't accomplish anything useful.

And, conveniently speaking of interest, that brings me to my last observation about *Chopper Strike* — I simply didn't find it very interesting. Nor did the others that I spoke to who had tried it. But the truth is, I found the other three chopper games that I tried to be uninteresting as well.

Luckily, *this* loop is not endless and the end is in sight. What I've tried to convey is that the appeal of entertainment such as a computer game is purely personal. I know *Chopper Strike* is a game that will be enjoyed by thousands of people *even though I didn't*. If you're a die-hard fan of chopper attack games, then you've got a winner for your collection here. If you're not, I suggest that you take a hard look at this one before you lay your money down.

(MichTron, 6655 Highland Road, Pontiac, MI 48054, 16K/32K cassette $27.95, disk $29.95, plus $3 S/H)

— Kevin Nickols

DOUBLE BUSTER

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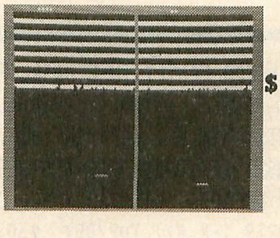

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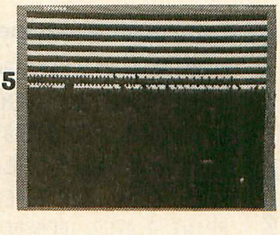

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Fractions And *Percents* — Two Low-Cost Teacher Aids

Fractions and *Percents* are two small BASIC programs from Shamrock Software that generate worksheets for elementary school students.

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The second program, *Percents,* is very similar to *Fractions.*

Both programs are very simple and remind me of the public domain programs that are available for the Commodore computers. These programs have not been available in large enough quantities for the Color Computer, however. On the other hand, the author of these programs thinks he deserves some remuneration for his work and is trying to make an honest buck, and you can't blame him for that. And at $9.95 each, you could almost think of them as free. For a teacher with a need of worksheets for the students, these programs could be of some help.

(Shamrock Software, 4382 Norton Road, Radnor, OH 43066, $9.95 each)

— Dr. Carlos Calle

RS-232 Switcher A Big Help

A lot of CoCo owners have more than one RS-232 driven device (such as a printer or a modem), and it gets tiring to have to keep pulling the plugs every time you want to go from one to the other. It's certainly easy enough to make a switch to select between two or more devices (all you need is a three-pole switch with the appropriate number of positions), but the Metric Industries Model 102 switch box includes a number of "bells and whistles" that make it a very nice unit.

The Model 102's main feature is the set of indicator lights for each position (the 102 handles up to three peripherals). These lights are red, yellow and green, and light up anytime the corresponding RS-232 jack is selected with the computer switched on (so they serve as pilot lights as well). The three jacks are labeled with red, yellow and green dots, and a set of stickers in the three colors is provided to label your equipment.

Aside from that, the 102 is no better or worse than an ordinary RS-232 switch. It is well constructed in an aluminum case with an attractive blue finish. The cable going to the computer is only about a foot long, so the switch will have to sit very close to the CoCo (this may be a benefit if you have a lot of cables — and who doesn't?).

If you don't mind paying a little extra for special features and durability, the Metric Industries Model 102 may be your best choice.

(Metric Industries, Dept. R, Box 42396, Cincinnati, OH 45242, $35.95 plus $3 S/H)

— Ed Ellers

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The Disk To Tape Transfer . . . Track By Track

By Wayne H. Duncan

Most of my diskettes were backed up with other diskettes so nothing major would be lost. Somewhere along the way came the idea, why waste 50 percent of my diskettes? Why not use tapes as backup?

After a little programming time, now my important diskettes are on tape. To speed up the fairly slow process, machine code is used to transfer the data to and from buffer. *Dump/Restore* may be modified to load all or part of the tape. By loading just track 17, the directory may be restored. Be careful not to start a restore to a good diskette since the program assumes it to be initialized and blank.

Dump/Restore dumps a diskette to cassette one track at a time. The command *DSKI$* is executed against track 17 cylinder two to read the directory. Only those tracks which have a used granule are read by the *DSKI$* and copied to a buffer area. A *VARPTR* is used to locate the two variables of the *DSKI$* and machine code then copies the data serially into the buffer. After one track is in the buffer a *CSAVEM* is made to move the data to cassette. Almost the reverse is done to move the data to diskette. Lines 300 to 370 do the *EXEC* to move the data and Lines 500 to 560 are the machine code to move the data from or to buffer. The restore may be started at any program on the tape to restore one or more tracks since the programs on tape are named for the corresponding track.

(Wayne Duncan has been in the computer field for 18 years, doing everything from repair to programming, and is now a field manager for a major computer company.)

220 43
END 32

The listing:

```
1 'DUMP/RESTORE
2 'BY WAYNE H. DUNCAN
5 CLS:PCLEAR1:CLEAR2000,9240
6 PRINT"DUMP/RESTORE - ENTER (D/
R)":INPUTZ$:IF Z$="R"THEN 200 EL
SE IF Z$="D" THEN 7 ELSE 2
7 CLS:PRINT"STARTING DUMP - ENTE
R WHEN TAPE IS READY TO RECORD A
ND DISKETTE IS READY":INPUTZZ$:D
SKI$ 0,17,2,C$,D$
8 CLS:FOR Z=1TO67 STEP2:C=ASC(MI
D$(C$,Z,1)):C1=ASC(MID$(C$,(Z+1)
,1)):IF C=255 AND C1=255  THEN N
EXTZ ELSE Y=INT(Z/2)
9 M=10240:POKE9242,40:POKE9243,0
:PRINT@32,"SECTOR":PRINT@43,"TRA
CK"
10 IF Z>67 THEN 40
11 FORX=1TO18
20 DSKI$ 0,Y,X,A$,B$
22 GOSUB300
25 PRINT@65,X:PRINT@76,Y
30 NEXTX:POKE&HFF40,0:CSAVEM STR
$(Y),10240,M,M:IF Z<68 THENNEXTZ
40 CSAVEM"END",10240,10250,10240
:PRINT"DUMP COMPLETE":STOP
200 'RESTORE
205 CLS:PRINT"STARTING RESTORE"
210 PRINT"MAKE RESTORE TAPE READ
Y AND       FORMATTED DISK READY":
INPUTZ1$
215 FORY=0TO34:N$=""
220 CLOADM:POKE9242,40:POKE9243,
0:M=10240:FORL=0TO7:N$=N$+CHR$(P
EEK(475+L)):NEXTL:Y=VAL(N$)
225 IF LEFT$(N$,2)="ND" THEN CLS
:PRINT"RESTORE COMPLETE":STOP
230 A$=STRING$(128,65):B$=A$:CLS
:PRINT@32,"SECTOR":PRINT@43,"TRA
CK"
240 FORX=1TO18
250 GOSUB300:DSKO$ 0,Y,X,A$,B$
255 PRINT@65,X:PRINT@76,Y
260 NEXT X:POKE&HFF40,0:NEXTY:ST
OP
300 'MOVE - VARIABLE TO STORAGE
OR STORAGE TO VARIABLE
305 IF PEEK(9244)<>190 THEN GOSU
```

```
B500
310 A=VARPTR(A$):POKE9240,PEEK(A
+2):POKE9241,PEEK(A+3)
320 IF Z$="D" THEN EXEC9244 ELSE
 IF Z$="R" THEN EXEC9344
340 A=VARPTR(B$):POKE9240,PEEK(A
+2):POKE9241,PEEK(A+3)
350 IF Z$="D" THEN EXEC9244 ELSE
 IF Z$="R" THEN EXEC9344
360 M=M+256
370 RETURN
500 FORR=0TO22:READD:POKE(R+9244
),D
510 NEXTR
520 FORR=0TO22:READD:POKE(R+9344
),D
530 NEXTR
540 RETURN
550 DATA 190,36,24,16,190,36,26,
198,0,166,128,167,160,92,193,128
,38,247,16,191,36,26,57
560 DATA 190,36,24,16,190,36,26,
198,0,166,160,167,128,92,193,128
,38,247,16,191,36,26,57
```

Submitting Material To THE RAINBOW

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, THE RAINBOW, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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Witches' Knight Will Cast A Spell On You

I, Sir Gallant Gallant, have once again returned from another great Adventure. With nothing but my wits to aid me (well, almost nothing), I have traveled through many damp and dreary forests and have bested (almost) every foe in sight.

After returning from battle, I found my homeland to be enchanted by an evil sorceress. Being terribly alarmed, I began my struggle to try to rid the land of the evil witch while returning my brother, Sir Noble (our family names tend to be on the modest side) to his rightful throne (he has been turned into a frog).

I have been playing an Adventure called *Witches' Knight*, by PAL Creations. The game, you may have guessed, is a text Adventure game set in the medieval age.

The game requires practically every byte of the 32K machine, so you are going to have to unplug that disk drive. The game was supplied to me on cassette and I experienced some difficulty in loading the tape. Fortunately, it is recorded on both sides, so after a short struggle, I was off to Adventureland.

After the program is loaded you are greeted with a song and a short poem. Shortly, you are greeted with a list of verbs — a nice feature because you don't have to guess what strange sort of dialect some Adventure authors seem to have concerning verbs. After a quick look at the verbs, the actual Adventure begins.

When starting out, you begin in a forest that is somewhat confusing, but seems to be a fairly standard practice in Adventures: the directions seem to be constantly scrambled, so you never are really sure which way anything is. In other words, you may be standing by a rock. Suppose you decide to go west. You are now standing by a tree. Sounds easy enough. (That's what you think.) Feeling adventurous, you decide to go west again. Suddenly you are standing by that same rock. If this confuses you, you ought to try navigating through it when all directions carry equal consistency. Actually, this is supposedly a spell the witch has cast on the area to make you lose your sense of direction; and is to give the player a sense that the program is different every time; but it really seems to be more of a nuisance than anything else.

The Adventure does, however, offer lots of variety, and everything that is required will come fairly logically. (For example, if you find a door, you would not think of submerging it in the tuna salad, you should open it.) The Adventure allows the brave (?) Adventurer to bargain with creatures, to fly across the sky magically, to become a fish to help discover the pond, and to climb a beanstalk. As you can tell, the game is never dull.

The next item brings me to the one thing I am a real stickler for — documentation. Although the game does include some documentation, I do not really consider it ample enough, especially for a beginning Adventurer. The only documentation takes the form of one side of a 9½ x 11-inch sheet with loading directions and a few brief notes on how to play.

Sir Gallant can wholeheartedly recommend this program to any semi-experienced Adventurer who likes a good challenge. Fortunately, this is not a "solve-it-in-one-day-Adventure," and will take a great deal of time before it is completely solved. If the documentation were improved, and the seemingly random movement was changed, I would rank this one of the best Adventures available for the Color Computer. (Sir Gallant also notes that for the price it is a great deal).

Happy Adventuring and good luck! (You'll need it.)

(PAL Creations, 10456 Amantha Avenue, San Diego, CA 92126, $14.95)

— Eric W. Oberle

CANADIAN PAYROLL

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Setting The Scene

By George Firedrake and Art Canfil

Hi, We're Back

Yes, following the May 1984 issue, "GameMaster's Apprentice" took a vacation. Back in May we said Art Canfil would join us and so he has. From now on, your "GMA" authors will be George Firedrake (You probably know that he is an alter ego of Bob Albrecht — the dragon who lives within) and Art Canfil. Well, as you might suspect, a new person means new directions. Here are some things we *might* do. What we actually do depends somewhat on feedback from you, our readers.

— Art Canfil, Karl Albrecht, and Jim McClenahan have recently completed book and software called *TAIPAN: A Game in Context*, to be published by Hayden Book Company. Karl is 15, Jim is 16, and Art is somewhat older. We will share with you our ideas on contextual game design, beginning this time.

— In 15 years of writing how-to-do-it computer books, George Firedrake never got around to writing about disk files. In fact, George and Bob never really learned how to use disk files. So, we'll start a slow tutorial on disk files soon.

— We suspect many of you have never played a fantasy role playing game such as *Dungeons & Dragons* or *RuneQuest*. So we'll start including some beginner's stuff on how to play. We'll use excerpts from *Adventurer's Handbook: A Guide to Role Playing Games*, mentioned elsewhere in this article.

— Surely, but slowly, we'll build software tools to help GameMasters and players play a role playing game. This will be software to help manage "worlds of IF": software to store, retrieve, manage, and use information; software to help you design, and even optimize characters to play in games.

— Is anyone interested in a series of tutorials on how to write *computer* Adventure games? We'll consider doing this — of course, it means *we* will have to learn how to do it! If we do, we will focus on games that feature story-telling, problem-solving, and exploration, *not* on "kill monster, get treasure." We will be especially interested in designing games that parents and quite young children can play together as an enjoyable family learning experience.

> ***"We will be especially interested in designing games that parents and quite young children can play together as an enjoyable family learning experience."***

(George Firedrake, a.k.a. Bob Albrecht, is one of the most prolific authors in the microcomputer world today. A specialist in writing for beginners, he is author of numerous books including TRS-80 Color BASIC. *Art Canfil enjoys designing games and writing. He is co-author of* Taipan: A Game In Context.*)*

TAIPAN: A Game in Context

What is a contextual game? Home computers make possible a type of electronic game less based on exercising the reflexive speed of a person's brain stem than on your exercising the wonderful gray matter with which humans think. Some of the best of such games are those in which a complex environment is simulated by the program, and the player interacts in a "lifelike" manner with the game environment. We call these contextual computer games, or games in context. In *TAIPAN: A Game in Context* we want to give the CoCo user three things:

1) an understanding of some fundamental principles of game design;

2) a historical background of a particular game context, the turbulent China trade of the 1800's;

3) a step-by-step approach to actually writing a game in CoCo Extended BASIC.

We hope to make an enjoyable game that will provide many hours of challenging entertainment. We also hope to spark an interest in the historical background, the context in which the game is set.

Next time, we will set the scene: Hong Kong in the mid-1800's. In the meantime, we suggest you read *Tai-pan* by James Clavell and *Dynasty* by Robert S. Elegant. May you live in interesting times.

FANTASY ROLE PLAYING GAMES

Millions of young people, and many not-so-young, play fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, or dungeon master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are listed below.

Champions*. From Hero Games, 92A 21st Avenue, San Mateo, CA 94402.*

Dungeons & Dragons*. From TSR, P.O. Box 756, Lake Geneva, WI 53147.*

RuneQuest (RQ)*. From Chaosium, P.O. Box 6302, Albany, CA 94706.*

Tunnels & Trolls (T&T)*. From Blade, Box 1467, Scottsdale, AZ 85252.*

Beginners beware! The rule books are formidable. If you are a beginner, we suggest you start with the following books, both from Reston Publishing Company, 11480 Sunset Hills Road, Reston, VA 22090.

Adventurer's Handbook: A Guide to Role Playing Games *by Bob Albrecht & Greg Stafford.*

Through Dungeons Deep *by Robert Plamondon.*

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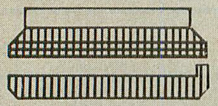

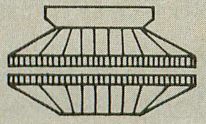

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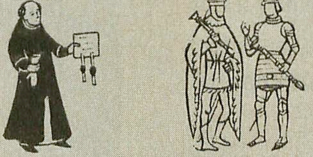

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A new beginner's assembly language tutorial column

Covering The Bases With Assembly Language

By R. Bartly Betts
with Programs by Chris Bone

You and I are going to try something different. "What is new about an assembly language tutorial?" you ask. Assembly language tutorial columns are not new. There have been lots of them and I have always had difficulty following the concepts they teach. Perhaps it is because the authors knew too darn much about their subject. They weren't writing on my level. Things they thought were too basic to need explaining just didn't exist in my repertoire. Although I have done a bit of research since then, I am very much in the beginner's stage and still have most of my beginner's questions.

"What is a beginner doing writing a column in a reputable magazine?" you exclaim! Well, when the RAINBOW asked me if I felt qualified to write a column on assembly language, I was just too excited to say no.

"A piece of cake," I told them, while trying to wash away a tell-tale green from around my assembly language ears. Anyway, I figured, if the problem with other assembly language tutorials was too much knowledge on the part of the author, I was super-qualified, in the reverse direction.

So, if you are an assembly language beginner, or want to be, then stay tuned; we speak the same language. For those who are further advanced, well, don't turn us off yet. I can guarantee that, with the help of my friend, Chris Bone, who is an assembly language wiz, this column is going to have some pretty useful programs.

(Bartly Betts is a former reporter and magazine editor now operating a retail store and custom leather shop in Brooks, Alberta, Canada. He has owned and operated a Color Computer for over three years and is presently taking an electronics and computer course by correspondence. Chris Bone is a college computer science major and has been programming for more than three years. He averages between six and nine hours a day on the CoCo.)

What It Takes

If your first questions have to do with what it takes to begin assembly language programming and how much trouble it is to learn, then here are your first answers:

You will need time and the desire to learn. In some ways assembly language is easier to learn than BASIC and in some ways it is harder. I counted 72 commands in the *EDTASM+* instruction manual but, because they are mnemonic (i.e., designed to represent actual English equivalents), they are easy to learn. There are also a few editor commands, assembler commands and switches, ZBUG commands, pseudo codes and error messages to learn. They are all easy to remember once you begin working with them. The hard part comes when you have to manipulate bits and bytes and accumulators and registers and stacks and pointers. However, in case you're feeling discouraged, take my assurance, you can do it — if I can, anyone can. I do want you to realize that there is pain with the gain and you will have to put in a long-term effort to become proficient.

You will need an editor assembler to write and edit the code. It would be difficult to provide instructions for more than one, so we will be using Radio Shack's *EDTASM+*. I have the ROM Pak version converted to run on disk.

It would be handy to have at least one good book on 6809 assembly language. I am using Lance A. Leventhal's *6809 Assembly Language Programming*, published by Osborne/McGraw-Hill. Pretty well any large computer store would carry it or could order the book for you. Radio Shack also has come out with a 6809 assembly language instruction book that I understand is quite good.

Having a calculator on hand can be quite useful for some of the conversions you will be wanting to do, but they can all be done by hand or on the computer. In fact *EDTASM+++* has a ZBUG calculator built in that is very useful.

Of course, you must have at least a minimum of a 16K Color BASIC Computer.

Getting On Second

One thing that kept me confused about assembly language for a long time was the difference between it and machine language. The two terms are often used interchangeably. Assembly language, like BASIC, FORTRAN or PASCAL, is a language. It is not code that the computer can understand without interpretation. The product of an assembly language program is called source code. The computer must translate this code into machine language, the code which directs the computer on the paths that accomplish a particular job. Pure machine code is in binary. That is, in a numbering system of base two.

Despite what some authors have said, an understanding of binary and hexadecimal (base 16) numbering systems is essential to assembly language programming.

Binary Is Easy

The secret to any numbering system is memorizing what each number column represents. You are most familiar with a base 10 system. That is, from left to right, the first column represents ones, the second column tens, the third hundreds, the forth thousands, the fifth ten thousands, etc. The number 12345, when put under the appropriate column looks like this:

ten thousands	thousands	hundreds	tens	ones
1	2	3	4	5

The actual calculation would look like this: (1 x 10,000)+(2 x 1000)+(3 x 100)+(4 x 10)+(5 x 1).

Another way of looking at the value of the columns is to realize that the rightmost column is 10 to the power of zero. The next column is 10 to the power of one, the third 10 to the power of two, the forth is 10 to the power of three, etc.

When using binary numbers (remember that they are a base two) you can read them exactly the same way except the columns represent different values. The binary columns look like this:

128 64 32 16 8 4 2 1

The rightmost column has a value of one, the next a value of two, the next a value of four, etc. An easy way to remember the values is to note that, from right to left, each column has double the value of the preceding column.

Now, with this in mind, let's look at the binary number of 11010011. Put under its columns it would look like this:

128	64	32	16	8	4	2	1
1	1	0	1	0	0	1	1

Thus you have (1 x 128)+(1 x 64)++(0 x 32)+(1 x 16)+(0 x 8)+(0 x 4)+(1 x 2)+(1 x 1), or 128+64+0+16+0+0+2+1 totaling 211 in the decimal numbering system we are most familiar with. As you can see, the rightmost column is two to the power of zero, the next column is two to the power of one, the next is two to the power of two, etc.

And this is the numeric language that almost all computers understand. These columns are like switches in the computer and each switch has only two positions, off or on. Each switch is called a bit and a gang of eight switches is called a byte. If you split a byte in half, the two four-bit sections become a nibble. A computer's memory is divided into memory units of bytes, each with a specific numeric location. Thus, in BASIC, when you poke a number into a memory location (each memory location consists of eight bits), the computer converts the decimal number into binary code and each of the eight bits is turned either off or on. Those eight bits, or each byte, represents either an instruction to the computer or is an actual number to be used by an instruction.

This is what assembly language is all about — putting instruction codes into memory along with the necessary numeric data that the instructions will act upon. For instance, the binary code 10001011 tells the 6809 microprocessor in your computer to add a number to accumulator A.

A Hex On Hexadecimal

"Ah," you say. "Now I am ready to learn how to put those instructions into the computer."

"But, not quite yet," I say. "There is still hexadecimal to contend with."

"And what the blazes is hexadecimal?" you ask.

"To explain such mysteries is what I am here for," says I.

Hexadecimal is just another numbering system; this time, to the base of 16. Put into its columns, it looks like this:

4096 256 16 1

As with the other numbering systems, each column is a power of 16 . . . 16 to the power of zero, 16 to the power of one, 16 to the power of two, etc. But, there is one other little problem. Whereas base 10 numbers are represented by the single-digit symbols zero through nine, hexadecimal needs single-digit symbols for the numbers zero through 15. What can be used for numbers after nine? Whether for good or bad, the symbols for 10 through 15 have been chosen as A, B, C, D, E and F. Thus the count of zero through 15 in hexadecimal is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. In hexadecimal, the number 11 would be written 'B'.

"If hexadecimal has to look that bad, why use it?" you might ask. Personally, I hated the whole concept until I actually started trying to do some assembly language programming. Then it comes in mighty handy, but I still don't like it. The conversion between Hex and decimal is time consuming and I just can't get a mental picture of a number represented in Hex. Like, what the heck does AB6C mean in real life?

But Hex and binary are bosom buddies and that is why you need Hex, even if you can't love it. Hex to binary and binary to Hex conversion is a snap, and seeing as binary to decimal and decimal to binary isn't too difficult, knowing all three makes transitions much easier.

The hard way of converting decimal to Hex is by division. Let's take the decimal number 121 and convert it to Hex: The highest Hex column that will divide into 121 is 16 . . . 121 divided by 16 equals 7 with a remainder of nine. The seven now goes into the 16's column of the Hex number as illustrated and we are left with a remainder of 9 which is too small to be divided by anything larger than the one's column. Thus the nine will go into the one's column of the

Hex number and the resulting Hex number is 79; decimal 121 = Hex 79.

```
4096   256   16   1
===================
  0     0     7   9
```

That looked quite easy, too easy in fact, so lets try another one . . . how about 2755? The process looks like this: The decimal number 2755 is divided by 256 and the result is 10 in decimal or A in Hex. So A goes into the 256 column. There is a remainder of 195 which is divided by 16 and equals 12 in decimal or C in Hex with a remainder of three. The Hex C goes into the 16's column and, as there is no more division possible, the three goes into the one's column. Thus 2755 in decimal equals AC3 in Hex.

```
4096   256   16   1
===================
  0     A     C   3
```

By now you are probably screaming that your computer can do all this slick as a whistle using *HEX$*. You are right, but often your computer is tied up doing other things and is not available.

Third Base And Going Home

So, how do they all tie together? Well, you will be using all three when you do assembly language. For, instance, suppose you want to display some graphics at memory location 4112 decimal, (this is graphics memory in the first *PMODE 4* page) and you want to turn on the first three pixels or dots in that memory location.

Can you guess why it is desirable to know binary and Hex? I'll bet you got it. Turning on the first three bits in a byte will require a binary number of 11100000. In binary, one equals "on" and zero equals "off." But how do you get that binary number in graphics screen memory location 4112? Here is where Hex comes in handy.

First, break the binary number into two nibbles of 1110 and 0000. Binary 1110 is converted to decimal 14. Of course binary 0000 in decimal is zero. To convert the entire binary number to decimal takes a bit more work, but not so for Hex. In Hex the decimal 14 becomes 'E' and the decimal zero is still zero. Binary 11100000 is E0 in Hex. Now, turn on your computer and type in and *RUN:*

```
10 PMODE 4,1
20 SCREEN 1,1
30 PCLS
40 POKE 4112,&HE0
50 GOTO 50
```

If you look closely at the screen you should see three little dots. Hit BREAK and change the Hex number. How about a dot pattern like this (.. .. ..)? In binary that is 11011011. Converted to two nibbles you have 1101 and 1011. That is 13 and 11 in decimal, or DB in Hex. Put *&HDB* in Line 40 instead of *&HE0*.

Now you realize that this is the second way of converting decimal to Hex. First convert the decimal to binary and then convert the binary to Hex. For most of us it is a lot quicker than the division method.

Perhaps you would like to do something a little more impressive. Listing 3 is a short BASIC program to create the letter 'A' on the graphic screen in the same manner described above, (Listing 1 must be in memory for it to work). Line 110 contains the data for the dot pattern of the letter 'A'. This pattern is then poked into the graphic screen memory and there it is. If you would like to have an illustration of how the bytes are formatted to form the character, *ENTER* and *RUN* Listing 3.

Where Does It Lead?

Now you are operating in all three numeric bases and, hopefully, you are doing so with ease. If I have been successful, I have transferred several months of searching on my part into just a few minutes reading on your part. I have also introduced a concept we will be using to provide a neat utility that when complete will allow you to run your BASIC programs on a 51-column screen with upper- and lowercase letters. That is the assembly language program that we will be leading up to in the next two or three columns. At the same time we plan to provide you with lots of sample programs and routines.

Next month we will be looking into the actual use of the editor/assembler program and the operation of the assembly code. You now have the background to get into the real meat of things. In the course of this column, I plan to explain all of the assembly language or "op codes," how and where they are used and how they operate. I will assume you have no previous knowledge and will keep things as simple as I can make them. This will mean that, if you are going ahead on your own, the column might seem a bit slow at times. For this reason I will also try to provide some information at a higher level.

Decimal, Binary and Hex Hardcopy

To make life easier in your conversions, running Listings 1 and 2 will produce a decimal, binary and Hex conversion printout over a selected range from zero to 255. The assembly language source code is well commented so those who are already into assembly language programming can follow its logic. Even if you are a beginner, study your *EDTASM+* manual and learn how to enter and assemble it. Then *CLOADM* or *LOADM* the resultant machine language program. *CLOAD* or *LOAD* the BASIC program in Listing 2 and *RUN* it. You will get a printout of the 256 numbers in all three bases.

We Would Like To Hear From You

Both Chris and I would be very interested in your comments. If you have any reactions you would like to share with us please communicate by letter or phone. If you call, make it in the evenings between 7 and 10 p.m. (but not collect, please). Chris's number is (403) 362-5650 and my number is (403) 378-4550. You can write to me at P.O. Box 184, Rosemary, Alberta, Canada, T0J 2W0. We welcome comments, both good or bad and would be pleased to answer any questions we can. If they are assembly language questions call Chris. I will field the comments. Chris says to be kind though, he is a temperamental artist.

Listing 1:

```
00010 *************************
00020 * PRINT AN 8 BIT NUMBER *
00030 * CALLED WITH: A=USR0(X)*
00040 * WHERE X=VALUE TO BE   *
```

```
                   00050 * PRINTED (0-255)         *
                   00060 *************************
0000 BD    B3ED    00070 START   JSR     $B3ED    *GET ARGUMENT =>D
0003 86    08      00080         LDA     #8       *8 BITS/BYTE
0005 34    02      00090 LOOP    PSHS    A        *SAVE CURRENT BIT COUNT
0007 58            00100         ASLB             *MOVE BIT 7 OF B => C FLAG OF CC
0008 24    04      00110         BCC     ZERO     *IF C FLAG=0 BRANCH
000A 86    31      00120         LDA     #'1      *PUT ASCII CODE FOR 1 =>A
000C 20    02      00130         BRA     PRINT    *GO OUPUT
000E 86    30      00140 ZERO    LDA     #'0      *PUT ASCII CODE FOR 0 =>A
0010 AD    9F A002 00150 PRINT   JSR     [$A002]  *OUTPUT CHR$(A)
0014 35    02      00160         PULS    A        *GET CURRENT BIT COUNT
0016 4A            00170         DECA             *A=A-1
0017 26    EC      00180         BNE     LOOP     *IF A<>0 GOTO LOOP
0019 39            00190         RTS              *RETURN TO BASIC
           0000    00200         END
00000 TOTAL ERRORS
```

```
1 CLEAR 20,&H3EFF
10 ' SAMPLE USE OF ROUTINE TO PR
INT A TABLE OF VALUES
20 INPUT"SCREEN TO PRINTER (S/P)
";SP$
21 INPUT"RANGE (0-255)-(0-255)";
R1,R2
30 IF SP$="S"THEN S1=0:S2=0ELSES
1=-2:S2=254
40 DEFUSR0=&H3F00
50 FOR X=R1 TO R2
60 PRINT#S1,X;TAB(6);
70 POKE&H6F,S2:A=USR0(X)
80 PRINT#S1,TAB(16)HEX$(X)
90 NEXT
100 GOTO 20
```

Listing 3:

```
10 ' POKE THE LETTER A INTO GRAP
HICS MEMORY
20 ' LINE 60 CHANGES THE CODE TO
 PRINT A 0 TO A SPACE
30 ' THIS ALLOWS EASIER VIEWING
OF THE PRINTED OUTPUT
40 INPUT"DO YOU WANT TO SEE THE
GRAPHICS OR BINARY OUTPUT (G/B)"
;BG$
50 DEFUSR0=&H3F00
60 POKE&H700F,32
70 PMODE4,1:PCLS:SCREEN1,1
80 FOR X=1 TO 10
90 READ A
100 IF BG$="B" THENA=USR0(A):PRI
NT
110 POKE&H1010+32*X,A
120 NEXT
130 GOTO130
140 DATA 16,40,68,130
150 DATA 130,130,254,130
160 DATA 130,130
```

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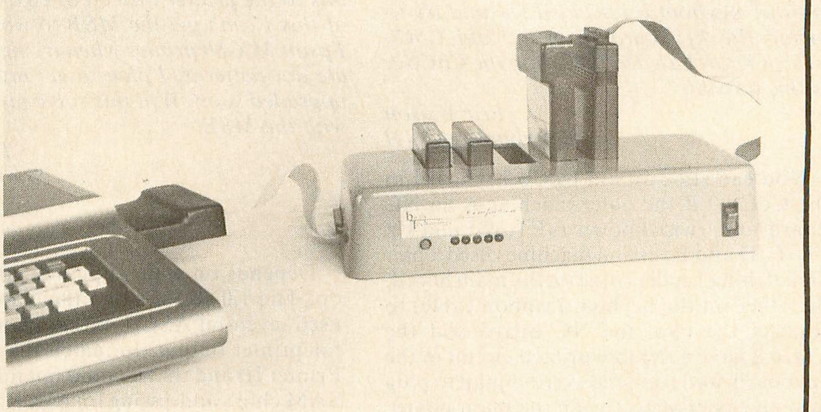

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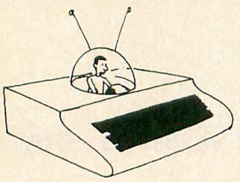

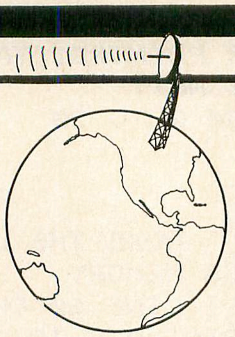

Sure, You Can Swap Keyboards — Maybe

By Ed Ellers
Rainbow Technical Writer

• *Recently I purchased a new keyboard for my CoCo and set the old keyboard aside. I now find myself purchasing a 16K CoCo 2 with a damaged keyboard. Instead of buying another keyboard, I decided I would try to install the keyboard from my old CoCo (which I purchased in 1982) into the CoCo 2. Is this possible?*

Eric Wilson
Peterborough, NH

You can stick an old CoCo keyboard in the CoCo 2 if the older machine is an NC board (otherwise known as ET, 285 and F). The C, D and E version machines used a pair of matching headers (one on the main board, the other on the keyboard ribbon cable) to connect the two; the NC board and the CoCo 2 have a flexible printed circuit in the keyboard, and it extends via a pigtail to plug into an edge connector on the main board. All CoCo keyboards rest on the mounting posts in the same way, so the old keyboard will fit properly in the case. Be very careful in handling the ribbon cable pigtail, as it is somewhat delicate. You may also have some problems with RF interference; the CoCo 2 depends on a metal plate on the bottom of the keyboard to cut down on RFI radiated by the keyboard, but the old keyboard won't have this plate.

(Ed Ellers, a RAINBOW *and* PCM *staff member, is a self-confessed electronics fanatic whose other interests include science fiction.)*

A Missing Bit

• *I have an old CoCo with the 1.0 Color* BASIC *ROM. This ROM only sends seven bits to the printer instead of eight. Because of this I can't get the MSB to work on my Epson MX-80 printer when trying to generate dot patterns. I plan to get my machine upgraded soon. Will this solve my problem with the MSB?*

Tory Lyon
Morrison, CO

Depends on which upgrade you want to do. The 1.0 ROM's two flaws were that it used seven-bit ASCII, rather than eight-bit, for printer output (to match the old Quick Printer II) and that it could not initialize the SAM chip's addressing for 64K RAM chips. If you have Radio Shack put in the 64K upgrade, they will install a newer BASIC ROM at no extra charge to make it work. Getting the ROM by itself may be a problem; I don't know if they will stick a new ROM in simply on request (or how much they might charge). If you had bought a Radio Shack printer (current models require eight-bit output), they would install the new ROM for you to make your printer work, but whether they will do it for someone who bought "somebody else's" printer is another matter. Radio Shack also offered at one time an eight-bit driver patch program (part number 700-2013); this may still be available.

Preserving Memories

• *I was wondering if it is possible to make a small device which can be fitted to the CoCo which will keep the memory powered while the rest of the computer is switched off?*

Richard Goodman
College Station, TX

Sadly, it isn't as easy as that. The CoCo (as with most other microcomputers) uses "dynamic" memory chips, rather than the more expensive "static" RAMs. A static memory system will hold its data as long as power is going into the chips, but with dynamic memory you have to constantly "refresh" the memory; in the CoCo it's done simply by accessing the memory every few milliseconds, and the job is handled nicely by the SAM chip. To keep dynamic RAMs running while the system is shut down, you would need to keep the refresh cycles going in some way, and you would have to keep your circuit from interfering with the SAM chip's operation. One false move in the transition from one to the other and you'll lose your data faster than you can say "6883!"

Higher Resolution

• *There are a few boards on the market (like WordPak by PBJ) that give an 80-column display for a monitor. The way I understand it, a different video generator chip is used. This gives more pixels to form characters with. Could this higher resolution be used in the graphics pages?*

David Moulton
Cody, WY

If you're talking about addressing the external system the way you would the CoCo's own 6847 video chip, forget it. These boards are very different from the CoCo's video circuitry, and all the ones I've heard of are designed for high-density text display only.

Byting the Apple

• *I'm looking for someone who has a program to read Apple II disks on a CoCo using either Disk BASIC or OS-9.*

Larry Owen
Phoenix, AZ

I haven't heard of any, and there's a very good reason why it isn't done routinely. The CoCo and most other personal computers use a special disk controller chip, and these are usually designed to use a standard format developed by IBM some 10 years ago (although there are many variations and two different encoding schemes used now). The Apple II uses a rather ingenious circuit that Apple co-founder Steve Wozniak designed using readily available chips; it has stood the test of time so well that an improved single-chip version is used in the new Apple IIc and Macintosh, but it doesn't seem to be compatible with the "standard" disk controllers! (I'm sure that some of the more intrepid hackers among us will take this as a dare rather than a fact of life; I'd like to see somebody bridge this gap.)

CoCo Meets Model I

• *Another teacher and I have personal Color Computers. Our school has three Model I cassette systems. Next fall, these will be transferred from the "computer room" to the library and the other teacher's classroom. We are very anxious to be able to use CoCo and Model I programs interchangeably.*

We are able to write and convert BASIC programs, if not too complex, but cannot handle machine language and hardware adaptations ourselves. What do we need to accomplish our purpose?

Barbara Hass
Fallsburg, NY

About the only things the Model I and the CoCo have in common are that they are both made by Radio Shack and both use Microsoft BASIC. "Converting" machine-language programs from one to the other will actually mean writing an entirely new program, because the CoCo's 6809 processor just isn't compatible with the Z80 used in the Model I, III and 4. There is a program from Spectral Associates called *Magic Box* that will allow Model I (BASIC only) cassettes to be loaded directly into the CoCo.

Snow — in New Mexico — in August?

• *I have a D board CoCo with 32K "piggyback" RAM. My problem is that I cannot use the upper 16K for Hi-Res video display; all I get when I try it is a lot of snow. This has kept me from using a lot of programs. Is there anything I can do to fix this? Would the same thing happen if I go to 64K?*

Michael Kromeke
Albuquerque, NM

You seem to have a better idea of the problem than many others I've heard this complaint from. The problem is that the usual "piggyback" modification doesn't make the right connections for video RAM access. When you try to use a Hi-Res screen placed in the upper bank, the plotting takes place in the upper bank, but the CoCo's video chip displays what's in the the corresponding area in the lower 16K bank. Some hardware nuts have tried to fix this problem, with varying degrees of success; with 64K RAM chips priced at $40 or so a set, I'd suggest a 64K upgrade as a better solution, as Hi-Res displays work fine in the full 32K available in BASIC.

Who's On First?

• *People talk of CoCo third-party software companies. Radio Shack is obviously the CoCo's first-party software company. Where can I go to buy some second-party software?*

Confused in California

You don't! Look at it this way, Bob. Radio Shack has the computer to sell; that makes them the first party in the transaction. You buy it; that makes you second. When you go to someone else for software, that makes them the third party. Obviously, second-party software is stuff you write yourself!

Packing It In

• *When I type in a program line, I can only make it 249 characters long. After the 249th character, the keyboard will not respond to anything except ENTER. If this is not a problem with my machine but a characteristic of the CoCo's design, why do you print programs in your magazine that contain lines longer than 249 characters (such as Line 75 of "Para-Jumper" on Page 179 of the December 1983 Rainbow)? If it is a problem, can you help me?*

Steve Bernstein
Union Grove, WI

Although the normal limit is 249 characters, the *EDIT* mode will let you pack a few more characters on the end of a line, to a certain limit. Unfortunately, in a few extreme cases, packing too many extra characters into a line will prevent the "detokenizing" routine in BASIC from doing its job completely, and *LLISTings* and ASCII saves of the program will be missing a few characters. Those who are submitting programs for publication in THE RAINBOW should avoid any temptation to pack the program lines. Packing is done for two reasons: to reduce the minimum memory requirements and to speed up execution of the program. In reality, it has only a minimal effect in this respect and holds the potential for causing considerable problems. "Stripping" utilities, programs especially designed to pack lines and remove unneeded spaces should be used with caution, as programs can be "overpacked," resulting in characters being left out of screen *LISTs* and *LLISTings* — even though the characters, or commands, are actually in the program and workable. When someone tries to type in a listing that has been overpacked, he will miss those few characters that are dropped from the tail end of overpacked lines.

In Search of Artifacts II

• *I often see programs for artificial colors in* PMODE 4, *but I can't get them. A program I wrote to draw vertical lines in every other dot column (to create solid colors) will only produce vertical yellow/blue, mixed with black, stripes, etc. What is the reason for this? Is it possible it is because my TV is for the PAL system? Or because my CoCo is the European version? If there are differences for Europe, I would like to know them.*

Cornelius Caesar
Hofheim, West Germany

The problem you're having is due primarily to the difference between the German PAL system and the American NTSC (National Television Systems Committee, an industry group) system. PAL stands for Phase Alternation Line, and it is a modification to the NTSC system to keep the various stages in the transmission chain from altering the colors of TV pictures (something most Americans will tell you happens all too often here). The artifact colors of red and blue, as I discussed in a previous column, are caused by the dots produced by the CoCo being locked to the color signal; in the PAL CoCo this is no longer so because of the phase alternation, and the colors produced (the yellow and blue) change from line to line. Most European sets have a delay line to complete the PAL error-cancellation process; the delay line is filtering out most of the false colors, as the comb filter in some American sets (based on the same type of delay line) does on broadcast signals (but not CoCo displays).

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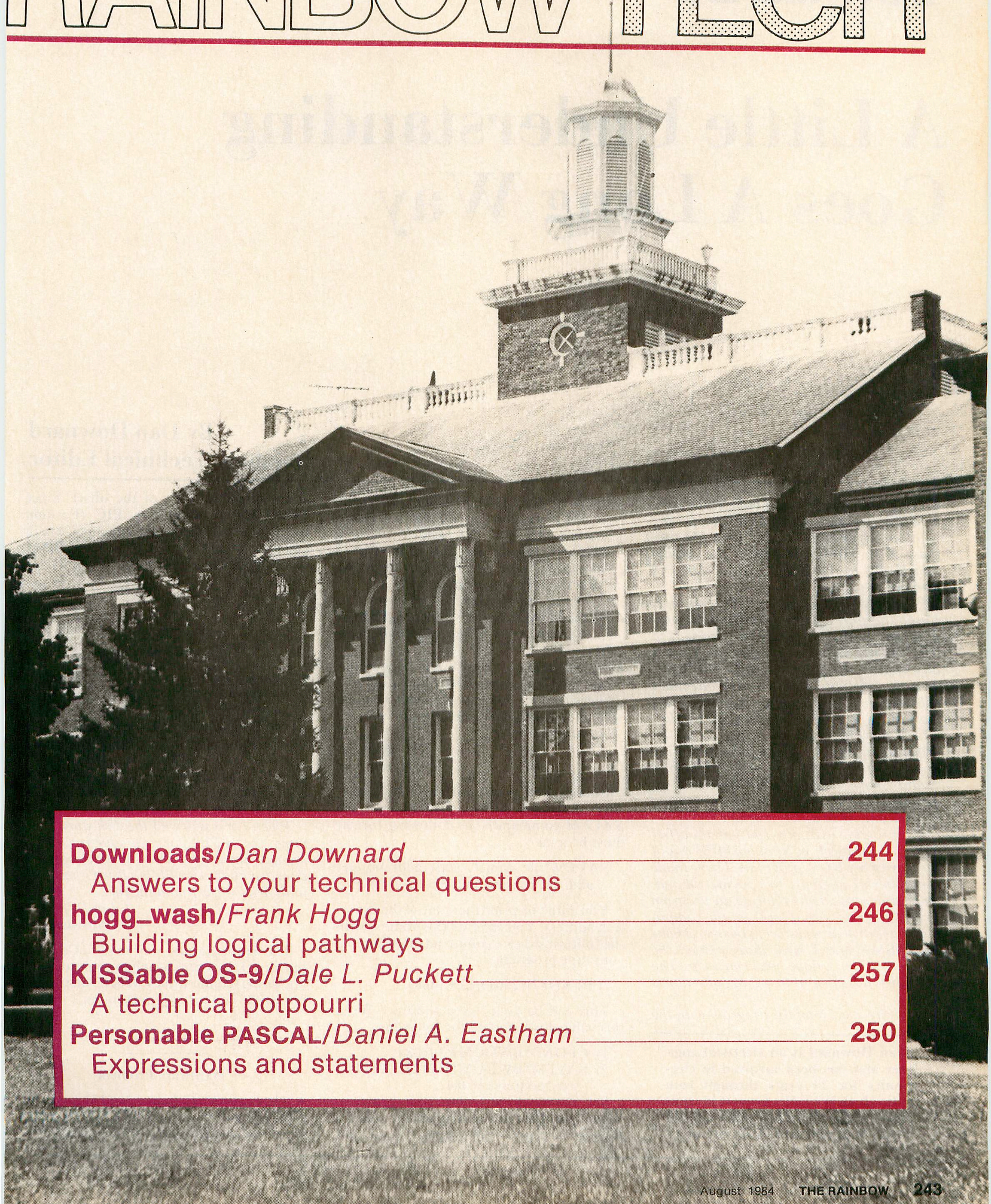

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A Little Understanding Goes A Long Way

By Dan Downard
Rainbow Technical Editor

• *I like your articles and I hope you will be able to help me with a problem I am having with a machine language program. The program is the* BWDUMP/BIN *that Radio Shack sells to dump a graphic screen to a printer.*

BWDUMP/BIN *was originally on a tape. I used the start address (14848) of the program and I chose an end address of 16127 to use with the* SAVEM *command to store it on my disk. I actually saved a few extra memory locations. I wanted to be sure that I collected the entire program from memory. Now I can use the* LOADM *command to reload the program, but I have to use an offset of 16384 to load the program in the upper part of RAM on my 64K CoCo 2. Radio Shack had originally loaded it at address 14848 and I guess they expected it to be used only with a 16K machine?*

The program as is, does run with the offset added. It fits nicely at location 30783 out of the way of my BASIC *programs. I have made a number of attempts to relocate the machine code, and when I relocate the program to any other address it locks up the computer. I have to do a cold start to recover. I have* EDTASM+ *and I have disassembled the machine code. I hope you can help. The solution is not obvious to me. My question is this:*

1) Why can I load the program with the offset of the LOADM *command which works okay, but I am unable to relocate the machine code? Yes, I know I can use it this way, but the lazy side of me would like to be able to just type* LOADM "BWDUMP" *and be done with it.*

2) What exactly does the offset portion of the LOADM *command do that makes it possible to run this program in the new location?*

3) The manual doesn't say much about the SAVEM *command. So as long as I have your attention, will you also include a more detailed explanation of this command.*

Terry E. Blake
Dayton, OH

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio [K4KWT]. His interest in computers began about five years ago and he has built several 68XX systems.)

Sounds like you're on the right track, Terry, but need a little understanding of the *SAVEM* command. The following format must be used:

```
SAVEM"file name", start address, end
  address, execute address
```

You didn't mention the value of the execution address. You can find this address with the following direct command after loading your tape program:

```
?PEEK(487)*256+PEEK(488)
```

This will be your "exec address." Write this value down and do the following:

```
1) CLOAD"BWDUMP",16384
2) SAVEM"BWDUMP",31232,32511,
     exec address+16384
```

See if that doesn't cure your problem. When you offset load a program the computer just increments every byte of your program by the amount of the offset. Since *BWDUMP* is written in PIC (Position Independent Code), it will run anywhere in memory. Well, anywhere there is free RAM space in the case of your CoCo.

Normal Procedure

• *I think I have a problem with one of my disk drives. First, I own a 64K CoCo (Rev. E), with Color* BASIC *1.1, Extended Color* BASIC *1.0 and Disk Extended* BASIC *1.0. I also own one disk drive from Radio Shack and one from MPI; Model 51S, S/N S661337, manufactured April, 1983. I purchased the 5¼ SSDD floppy disk drive at* RAINBOWfest *in New Brunswick, NJ.*

When I access drive 1 the disk starts spinning, the 'LED' goes on and my file is loaded. But when I access drive 0, not only does drive 0 find my file but drive 1 just spins until drive 0 has found the file.

Jon D. Abbott
Norwalk, CT

This is the normal way that CoCo disks operate, Jon. There is only one motor "on" line going to your drives. When you turn on one drive, you turn all of them on.

Hardware Problem

• *I have a 16K "E" board that I upgraded to 64K, using 4164's. I want to purchase a disk drive and upon the advice of my local Radio*

Shack Computer store representative, I had them install a 1.2 Color BASIC ROM, because he told me that I would be able to use the new CoCo 2 disk drive and run OS-9. I have heard horror stories from CoCo owners that have plugged in the wrong disk drive. HELP, which drive do I buy, the gray case or the white case? I saved the 1.1 ROM, just in case.

Larry B. Evans
Key West, FL

Larry, the 1.2 BASIC ROM has nothing to do with OS-9, or your disk drive selection. The problem of compatibility with disk drives is a hardware problem. Radio Shack redesigned the newer disk controller (white case) so that 12 volts is no longer required for operation, since the CoCo 2 no longer has 12 volts at the ROM port. The older disk controller (gray case) required 12 volts for operation. In a nutshell this means you can use the new disk controllers with the old CoCos but not vice versa. There is a way around this problem, though. If you purchase a Multi-Pak Interface for your CoCo 2 you can use the old disk controller since the Multi-Pak Interface supplies the 12 volts necessary for proper operation.

Tidying Up

• *Last month, Jack Thompson wrote about a disk problem and you suggested a head alignment kit. I have a similar problem on my one-disk system. I have no trouble with programs that are written on my drive, but every program I buy will not load. They start to load, then hang up with the motor running and the keyboard dead. If I can manage to get one loaded, and it's not copy protected, I can save it and then load it with no more troubles. But most will just not load. Where can such a kit be found? I have not seen one in the ads, and Radio Shack doesn't carry one. Better still, has an article been published which gives the procedure? I have test equipment and technical experience, but I need information.*

Mickey Kaylor
Cleveland, TN

Mickey, we have received several requests similar to yours. The head alignment kit we referred to is actually a head alignment disk. Several companies manufacture them. Radio Shack specifications are based on a "CAT'S-EYE" diskette.

These disks have a 125 kHz signal precisely recorded on tracks 00 and 34. By using an oscilloscope connected to the electronics in your disk drive you can measure the phase of the read head and "align" your heads. We do not recommend this for amateurs. If you're still game, obtain a copy of *Radio Shack Service Manual* #263022/3023. This is the floppy disk drive service manual and gives complete alignment procedures.

The only normal maintenance that should be necessary for your drive is cleaning your heads. Remove all of the accumulated oxide and dirt with a lint-free cloth using isopropyl alcohol. Be careful not to touch the head. Another method of cleaning your heads is by use of a head cleaning disk available from Radio Shack.

A Simple Solution

• *I just bought the DMP-100 Printer to add to my 64K CoCo and one disk drive.*

Would you please help me. How can I print whatever is on the TV screen without including a PRINT#-2, *in the program. I noticed that this can be done on other larger computers like the Model 4.*

M.B. Harada
Kailua, HI

You need a screen dump program such as *BWDUMP* from Radio Shack.

Fill 'Er Up

• *I have a problem that may or may not be of interest to the readers of* RAINBOW. *I am having a great problem saving programs on tape. The tape that I am using may be the problem. I need a program that will fill the tape with a program. It should give the start and then run till the computer is shut off. This way I could load the tape, then using* SKIPF"X" *verify that the tape had no bad spots in it.*

It seems that this could be done, but I have not been able to do it.

Robert Lister, Jr.
Aston, PA

Robert, try the following BASIC program:

```
10 FOR X=1TO1000
20 CSAVE"TEST"
30 NEXT X
```

This should record the program *TEST* 1,000 times on your tape. By using *SKIPF"X"*, after rewinding the tape, you should be able to check for bad tapes. There is one problem with this method. It doesn't check the part of the tape between programs. I would also recommend bulk erasing the tape before further use.

Getting A Running Start

• *I am writing a menu program for the Color Computer disk system. I have everything in the program finished except one thing. I cannot tell the CoCo to run a variable* (RUNF$). *You can* LOAD,SAVE, LOADM, *and* SAVEM *a variable but not* RUN. *How can I do this?*

Andy Dater
Medford, OR

If your program name is *F$* Andy try:

```
LOAD"F$",R
```

Index Addressing

• *I am a frustrated programmer. I have done fairly well with BASIC programming and have jumped off the deep end into the world of assembly language. With my trusty* Assembly Language Book *by William Barden, Jr., I have entered a quest of sleepless nights and much frustration.*

I wrote a simple BASIC program that uses Graphics, Pages one through seven to draw a panoramic scene. Then I displayed Page eight with Page four memory transferred to Page eight memory location; thus, Page four is on the screen. With the left or right arrow keys, I can pan from left to right and see all the landscape. But, I have to wait 15 seconds for the screen to shift, even with POKE 65495,0. *Thus, to give the program realism, I decided to make this my initial project for using assembly language. I have learned that:*

> *LDA #55 Load 'A' register with the number 55 (decimal)*
> *LDA #$55 Load 'A' register with the hexadecimal number 55 (85 decimal)*
> *LDA $55 Load 'A' register with contents of memory location $55 (decimal 85)*

Suppose I have a value that starts in a register (lets say 'X'), the value is used in calculations and the result is returned to the 'X' register. I now want the value of the contents located at the memory location in the 'X' register. How do I do it? If I store 'X', STX $3000, then I have a value stored in a specific memory. But, I want, not the value at $3000 but the value of the location indicated by the value at $3000. If you can help, I sure would appreciate it.

Clyde R. Vasey III
Durant, OK

You must use indexed adddressing, Clyde. If I'm reading you correctly, you want to store the value in, let's say, the 'A' register at the memory location indicated by the 'X' register. The assembly nmemonic for this step would be STA A,X.

Since you gave me a hint about what you are up to, you may try the following assembly source for moving any memory to another location.

```
     LDX   #$xxxx xxxx="from"address
     LDY   #$yyyy yyyy="to"address
LOOP LDD   ,X++
     STD   ,Y++
     CMPD  #$zzzz  zzzz="end" address
     BNE   LOOP
```

This method will work as long as the two areas of memory do not overlap.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 209, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity.

RAINBOWTECH

hogg_wash

Structure Out Of Chaos: Building Logical Pathways

By Frank Hogg
Rainbow Contributing Editor

58,752 sectors free

I would bet that you would like to have this many sectors available when you use your computer. On our office system this is the number of sectors available for our use, plus another 19,584 on the removable hard disk that is used for backup. Of course, I am talking about the Gimix III and a 19 meg hard disk. Now you can even get 47 and 72 meg hard disks. The 47 gives you something like 130,000 free and the 72 about 240,000 free. That is an incredible amount of space. This all seems wonderful until you consider what happens when a dozen different people use the system at the same time with directories helter-skelter and files all over the place. Pretty soon you have thousands of files in hundreds of directories and nobody but nobody knows where anything is!

This is the situation I found myself in a few months ago. We bought our Gimix III in January of 1983 and started using it right away. I had never had much experience with a multiuser system before so I didn't have any clear idea how to set up the disk for use other than giving everyone a directory of their own and letting them have a go at it. Chaos soon prevailed when, after about 10 months we started losing files on the disk. You knew you put it somewhere but you couldn't remember where or what name you used when you saved it. It was like trying to find a needle in a haystack.

About 14 months from day one, I embarked on the project of organizing this mess before it got totally out of hand. I started cleaning the disk of files that didn't need to be where they were. At the time I started there were almost 3,000 files in about 80 directories. When I finished there were a little over 1,000 files in only 65 directories. I did most of this by organizing the files into separate logical directories and then archiving some of those off to floppy disks. I also removed old files that were not needed anymore.

Since it was quite a task and it took a long time to complete, I didn't want to have to do it again so I worked on a structure to keep the disk organized and make it easier to both backup the disk and to properly archive the files from the disk. That would also make it easier to find things on the disk.

I started off with some basic rules, then I tried not to break them wherever possible. However, sometimes that was not always practical.

The rules:

1) The "root" directory should only have other directories, not files in it. This is a pretty solid rule.
2) Directories of a like type should be grouped in master directories. For instance, the users' directory contains directories of each user.
3) Master directories should be treated like root directories and not have files in them. The idea is to make each directory reasonably small so that it will be easy to find things by following a logical path.
4) Groups of files of like type should be in directories of their own.
5) Whenever there are more files than can be displayed on the screen at one time with dir, it is time to consider breaking the directory up into smaller directories.

Here is an example of the root directory of the hard disk: Master directories have a '*' after them.

```
directory of /H0 23:41:52
```

(Frank Hogg is the president of Frank Hogg Laboratory, one of the world's largest suppliers of software for 6809 based computers. He and his wife, Linda, live in Syracuse, N.Y.)

```
CMDS      DEFS      SYS       SYSTEM*
USERS*    INVOICE*  MAILING*  MINT*
STY       LIB       SPELL     MISC
```

The "CMDS," "DEFS" and "SYS" directories are familiar to OS-9 users because all OS-9 systems have them. The CMDS directory has all the user commands in it. The DEFS directory has the system definitions in it and the SYS directory has things like the system password and other system stuff in it. SYS is for OS-9 system files such as "password" and "motd."

SYSTEM is the superuser's master directory. USERS is a master directory and contains a directory for each logged-on user type which I will also explain later. The INVOICE, MAILING and MINT directories are our business directories. INVOICE is the series of business programs for our office. MAILING is our mailing list and MINT is for our dental office package that is under development. STY is a directory that is needed by the *Stylo* word processor. They should have put it in the SYS directory which would have made my disk neater. LIB is used by the C programming language. SPELL is for the *DynaSpell* spelling checker and, like *Stylo* should be in the SYS directory. MISC is a catchall to prevent things from being dumped into the root directory when someone is in a hurry.

Here is a "dir" of the SYSTEM directory:

```
              directory of SYSTEM 23:41:55

STAGING   SOURCE    BOOT      ARCHIVE
BACKUP
```

STAGING is a directory used to dump new software in preparation for installing it on the system. Once installed, it would then be deleted from STAGING. SOURCE is a directory of system source code. BOOT is the directory of files that are used to create a new OS-9 Boot. As new versions of OS-9 are released they can be installed from this directory.

ARCHIVE is a directory of files or commands that we want to remove from the system but are not quite sure we should. This would be where we would put a copy of an old program when we install a new version. In case the new one doesn't work we can retrieve the old one from ARCHIVE. Files in this directory should be deleted on a regular basis.

BACKUP is a directory that is logged into by other than the superuser. Special programs let any user do a major backup of the system as the superuser, but under program control to prevent damage. This was done so that I would not have to be stuck with backing up the system. A user logs in as "backup" and he/she is presented with a menu and instructions on what to do to run the backup procedures.

This is a directory of the USERS directory:
(Note: *all* of these are "master" directories.)

```
              directory of USERS 23:41:57

FRANK     JERI        CAROL       JIMI
DEB       DAVE        COLET       LETTERS
FLEX      MANUALS     SOFTNEWS    RICH
```

To be in this directory, a directory has to be one that is logged into. By that I mean that these are the default data directory upon login. The names of the directories follow the actual users' names until you get to LETTERS.

LETTERS contains answers to customers' letters in a special *DynaStar* mail/merge format. FLEX is the directory for O-Flex. MANUALS contains directories of the various manuals that we are working on. SOFTNEWS contains directories of each issue of our new *SoftNews* publication.

This is an example of a users' directory:

```
         directory of USERS/FRANK 23:41:59

MISC        ARCHIVE       DOC
```

MISC is a "catchall" to prevent garbage cluttering up the master directory. ARCHIVE is used to hold files previous to deleting them. DOC is for various documents such as letters, memos, etc. The individual may and should use other directories to prevent clutter from obscuring what is in his/her directory.

All users except the superuser log on into the user directory under the name they logged on as. The superuser logs on into the SYSTEM directory as user zero. The exception is the "backup" user who logs on into SYSTEM/BACKUP as the superuser for backup purposes.

System protection prevents anybody except the superuser from accessing the SYSTEM directory.

Here is a map of the system disk.

```
CMDS.......f
DEFS........f                          | STAGING....f
SYS..........f                         | SOURCE.....f
SYSTEM*..........................+BOOT.........f
USERS*..............+                  | ARCHIVE...f
INVOICE*......D     |                  | BACKUP.....f
MAILING*.....D      |                          | MISC........f
MINT*..........D    | FRANK*...........+ARCHIVE...f
STY..........f      | JERI*..........D  | DOC.........f
LIB.......... f     | CAROL*.......D
SPELL.......f       | JIMI*..........D
MISC........f       | DEB*...........D
                    | DAVE*.........D
                    | COLET*........D
                    | LETTERS*.....D
                    | FLEX*.........D
                    | MANUALS*...D
                    | SOFTNEWS*..D
                    | RICH*.........D

--D infers that the directory has other directories in it.
--f infers that the directory has only files in it.
```

We have been using this system for about a month and so far it is working very well. I hope that in a year from now I will be able to find this file without too much trouble. Let's see, I put it under MISC, or was it in the SOFTNEWS directory? Well, you can see that it is not going to be easy to keep track of files, even with this setup.

Put a filter in your pipe

OS-9 has a neat feature where you can redirect the output of a program somewhere else. Gee, that's nice, but what can be done with it? You can, of course, direct it to a printer or a file, but you can also direct it through a filter before going to the printer or anywhere else for that matter. This is called "piping" and is similar to a regular pipe if you think of the data as water in the pipe and the filter program as a filter in the pipe that will do something to the water as it passes through. Got the idea? Suppose you wanted to remove all the line feeds ($0A) from a text file before going to the printer. Normally you would write a program to read in the file, remove the line feeds, then write it out to another file. With OS-9 you could use the same program without the files and do the same thing.

Standard input and standard output

When programs refer to using these two things it means that I/O (input/output) can be redirected and used in a pipe. "List" is one of these commands as well as "build." Try this, first build a file with build like so:

```
OS9:build junk
? junk
? junk
? junk
?
```

Then do this:

```
OS9:list junk ! build test
????
OS9:list test
junk
junk
junk
```

Wasn't that an interesting and useful thing to do? Here is what happened. First we created a file called appropriately "junk," then we listed that file through a pipe (!) to "build" which created a file called "test" that had what "junk" had in it. The "?" appeared on the screen because we did not change the output of "build," it still went to standard output (the screen). If you typed this:

```
OS9:list junk ! build test >test1
```

the same thing would have happened except that the "????" would end up in the file called "test1." If you have "UtiliX" which has a utility called "wc" that counts words then you could have typed:

```
OS9:list junk ! build test ! wc
```

and "wc" would have reported that you had 8 characters and 4 words with 0 lines from the "?'s.

All of the above is quite useless of course but it is just an example of how pipes work and how I/O redirection can be used to do some fun things.

Thank you all for writing in suggestions and please keep them coming. I will get into the letters next month.

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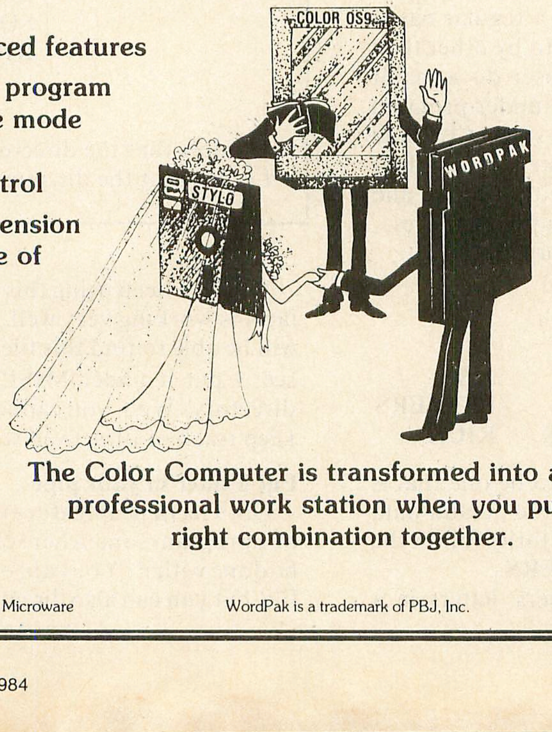

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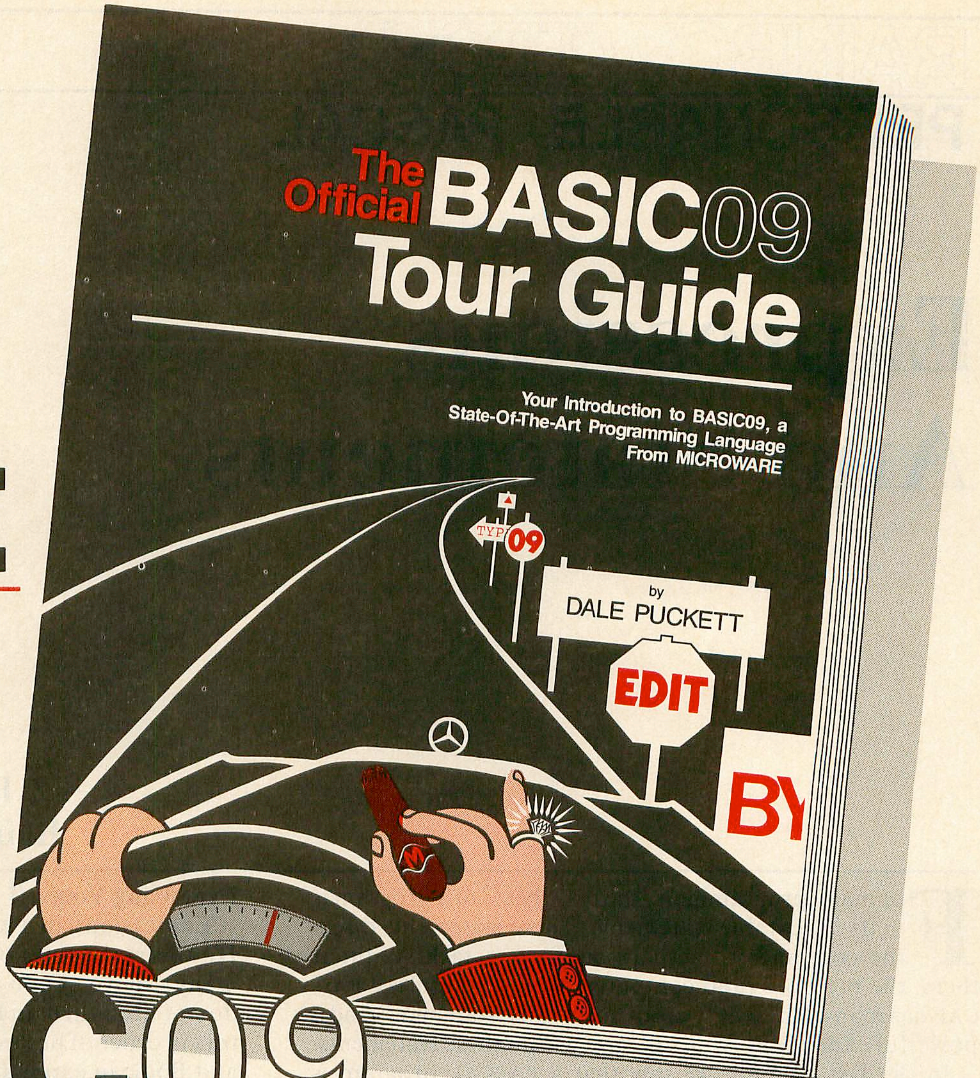
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RAINBOWTECH

PERSONABLE PASCAL

Expressions And Statements

By Daniel Adams Eastham
Rainbow Contributing Editor

For many programmers, the real "beef" of a program is in its executable statements. These statements direct the computer to actually perform a task. Without them, the program (and computer) would be useless. PASCAL has many different types of executable statements and a powerful expression syntax for use within these statements.

In the last column, we saw that a PASCAL program is divided into two major sections:

```
PROGRAM (header);
  (declaration statements)
BEGIN
  (executable statements)
END.
```

We also learned about some of the fundamental statements for declaring data and operating on it. As you can see above, the executable statements are those between the BEGIN and END. They are executed sequentially beginning with the statement immediately following the BEGIN and continue until the END statement is reached.

One statement that every programming language has is an assignment statement. For example:

```
Sum := Amount + 5;
```

This statement contains a variable (Sum) which is to receive a new value, an assignment operator (:=) and an expression (Amount + 5) which represents the value to be assigned.

(Daniel Adams Eastham holds a B.S. degree in computer science and has 13 years experience in systems and communications programming, including work on the original Telenet packet switching network. He is the author of the DEFT PASCAL Workbench *and is currently president of DEFT Systems, Inc.)*

Expressing Yourself

Expressions in PASCAL are similar to those in BASIC. However, the rules of precedence are not the same, and in many situations you need parentheses in PASCAL where you do not need them in BASIC. The following is a list of operators in order of precedence (highest is first) for Real, Integer and Boolean expressions:

Unary Operator:

NOT	Boolean Logical Negate

Multiplying Operators:

*	Multiply, Real or Integer
/	Real Divide
DIV	Integer Divide, Quotient
MOD	Integer Divide, Remainder
AND	Boolean Logical And

Addition Operators

+	Addition, Real or Integer
-	Subtraction, Real or Integer
OR	Boolean Logical Or

Relational Operators

=	Equals
<	Less Than
>	Greater Than
<>	Not Equals
<=	Less Than or Equal
>=	Greater Than or Equal

Note that not all the operators can be used with the different data types. For example, AND, OR, and NOT can only be used with Boolean data (or expressions), DIV and MOD operators are only allowed with Integer data and '/' always produces a Real result even if either or both operands are Integer. All relational operators can be used with any simple data type and produce a Boolean result.

As a result of all these rules, we can see some similarities and differences with BASIC. For example:

```
R + 13 / 2
```

The Integer constants 13 and two (Real constants have decimal points in them, i.e., 13) are converted to Real, divided, and the quotient is added to R. The following legal BASIC expression:

```
R=3.5 AND I=2
```

is *not* a legal PASCAL expression. This is because the AND operator has a higher level of precedence in PASCAL than it does in BASIC implying that the Real constant 3.5 should be ANDed with the Integer variable I before the first = comparison is done. To make this expression legal, we must add some parentheses:

```
(R=3.5) AND (I=2)
```

This forces the = comparisons to be completed first, providing two Boolean results which can then be ANDed together. In the following Boolean expression:

```
B1 OR B2 AND NOT B3
```

The Unary operation NOT is performed first followed by the AND and finally the OR operation.

In addition to these, there is also the relational operator IN for Sets. We will learn about Sets in a future column.

Compounding The Problem

In the last column we saw that the IF statement in PASCAL looks like this:

```
IF (Boolean expression) THEN (statement)
   [ ELSE (statement) ]
```

The only problem with this is that many times you want to execute *many* statements as the result of a test in an IF statement. In BASIC, you can do this by making a long line and separating the statements with colons. In PASCAL, you use the BEGIN statement:

```
BEGIN
   (statement);
        .
        .
        .
   (statement)
END
```

This is called a *compound* statement and allows you to insert many statements into the program at any point that a single statement is allowed. All the statements inside the BEGIN END are sequentially executed. Although standard PASCAL syntax does not allow a semicolon following the last statement, most PASCAL implements a *null* statement which allows you to include the last semicolon.

In our IF statement, we can therefore do the following:

```
IF (R=3.5) AND (I>=2) THEN BEGIN
   Sum := Amount + 5;
   IF Sum = 200 THEN Amount := 3;
   END
 ELSE Sum := Amount - 5;
```

The Boolean expression (R=3.5) AND (I>=2) is evaluated and if True the compound statement following the THEN is executed. If the Boolean expression is False then the statement following the ELSE is executed. This ELSE immediately follows the END of the compound statement.

Inside the compound statement you see another IF statement. This ability to allow any number of any type of statement at any point in your program is one of three major constructs in the PASCAL language that makes writing structured programs easy.

Easy Loops

The second major structured programming construct of PASCAL is its looping statements (the third construct is Procedures/Functions which will be described in a future column). In addition to the standard FOR statement which we talked about last time, PASCAL has two conditional looping constructs:

```
WHILE (Boolean expression) DO (statement)
REPEAT (statement; . . . ; (statement) UNTIL (Boolean
  expression)
```

The WHILE statement repetitively executes the statement following the DO as long as the value of the Boolean expression is true. An equivalent IF and GOTO setup would look like this:

```
100: IF (Boolean expression) THEN BEGIN
        (statement);
        GOTO 100;
        END;
```

The REPEAT statement repetitively executes the statements between the REPEAT and UNTIL, until the Boolean expression is False. An equivalent IF and GOTO setup for the REPEAT looks like this:

```
100: (statement);
           .
           .
           .
     (statement);
     IF NOT (Boolean expression) THEN GOTO 100;
```

The primary difference between the two statements is when the Boolean expression is evaluated. Because it is evaluated first in the WHILE statement, the statement following the DO may never be executed (much like the THEN part of an IF statement). Whereas in the REPEAT statement, the statements between the REPEAT and UNTIL are guaranteed to execute *at least once* since the Boolean expression is not evaluated until the end of the loop. For example:

```
WHILE R > 3 DO R := R - 2;
REPEAT R := R - 2 UNTIL R <= 3;
```

You will notice that if R has an initial value of three going into each of the above loops, it will come out with a different value three in the WHILE and one in the REPEAT.

Multiple Choice

Making a comparison and choosing between two courses of action is what the IF statement is all about. But sometimes you need to choose between more than two courses of action. This is where the CASE statement comes in:

```
CASE (ordinal expression) OF
   (constant),...,(constant) : (statement);
                .
                .
                .
   (constant),...,(constant) : (statement)
   END
```

In this statement, the ordinal expression (cannot be a Real type) is evaluated and then compared with each of the constants. If a match is found, then only the statement corresponding to the constant is executed and control then falls through to the statement following the CASE. In standard PASCAL, if none of the constants are equal to the value of the expression, the result of the CASE is undefined. However, in most PASCALs the result is that no statement is executed.

Many PASCAL compilers extend the CASE statement with an ELSE·or OTHERWISE clause:

```
CASE (ordinal expression) OF
   (constant),...,(constant) : (statement);
                .
                .
                .
   (constant),...,(constant) : (statement)
   ELSE (statement)
   END
```

When the ELSE (or OTHERWISE) clause is present and the expression does not equal any of the constants, then the statement following the ELSE is executed. For example:

```
CASE Ch OF
   'A','E','I','O','U' : I := 1;
   'Y' : I := 3
   ELSE I := 4
   END
```

In this example, Ch is a Char type variable and we want to know if it is vowel, a 'Y' or a consonant and the value of the variable 'I' is set accordingly.

Example Program

This example program finds the prime factors of an integer. First it prompts you for the number to be factored and then checks to see if the number is negative. If so, it negates it (makes it positive) and displays a factor of -1. Then it begins trying all the prime numbers (and some that are not prime numbers) up to the square root of the number. Each time that it finds a factor that will divide evenly into the number, it divides the number by that factor (more than once if possible) and displays that factor as well as the number of occurrences of that factor.

This continues until a factor is picked which is greater than the square root of the remaining number. If the remaining number is greater than one, then it is the last prime factor.

In the next column we will begin learning about the many ways that PASCAL lets you represent information.

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The listing:

```
DEFT PASCAL V3.0                  (C) 1984 DEFT SYSTEMS, INC.     PAGE   1
Prime Factors Program


00 0000     (*  This program factors an integer  *)
00 0000     (*  into its prime components.       *)
00 0000
00 0000     PROGRAM PrimeFactor (Input, Output);
00 0000
00 0000     VAR Number, Factor, Exponent : INTEGER;
00 0000
00 0000     BEGIN
01 0006       PAGE;
01 0012       WRITELN;
01 001A       WRITELN;
01 0022       WRITELN ('FIND PRIME FACTORS');
01 0046       WRITELN;
01 004E
01 004E       WRITE ('ENTER NUMBER: ');
01 006D       READLN (Number);
01 0081
01 0081       IF Number < 0 THEN BEGIN
02 008E         Number := -Number;
02 0097         WRITELN (-1)
02 00AE         END;
01 00B1
01 00B1       Factor := 2;
01 00B6       WHILE Factor <= Number DIV Factor DO BEGIN
02 00D0
02 00D0         IF Number MOD Factor = 0 THEN BEGIN
03 00EA           WRITE (Factor);
03 00FD           Exponent := 0;
03 0101
03 0101           REPEAT
03 0101             Number := Number DIV Factor;
03 0112             Exponent := Exponent + 1
03 0119           UNTIL Number MOD Factor <> 0;
03 0135
03 0135           CASE Exponent OF
03 0137             1 : WRITELN;
03 014A             2 : WRITELN (' SQUARED')
03 0169             ELSE WRITELN (' ** ',Exponent)
03 018E             END;
03 0191
03 0191           END;
02 0191         IF Factor = 2 THEN Factor := 3 ELSE Factor := Factor + 2
02 01AE         END;
01 01B5
01 01B5       IF Number > 1 THEN WRITELN (Number)
01 01D4     END.

SYMBOL        CLASS      STRUCT ALLOC       DATA TYPE       VALUE    LOW  HIGH  SIZE

EXPONENT      VARIABLE          AUTOMATIC   INTEGER          -10 -32768 32767     2
FACTOR        VARIABLE          AUTOMATIC   INTEGER           -8 -32768 32767     2
NUMBER        VARIABLE          AUTOMATIC   INTEGER           -6 -32768 32767     2

STACK REQUIREMENTS:      28

CODE SIZE             475
UNUSED STACK        33406
MAX SYMBOLS            99
TOTAL ERRORS            0
SOURCE FILE:  FACTOR:1
OBJECT FILE:  FACTOR:1
```

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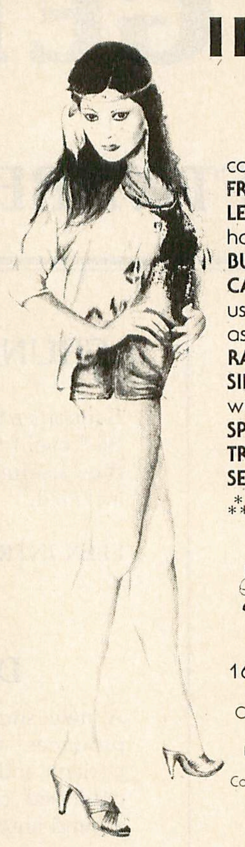

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RAINBOWTECH

KISSABLE OS-9

Genius, Assembly Tips And A Bilingual Benchmark

Dale Puckett
Rainbow Contributing Editor

There's a genius lurking around every corner, at least it seemed that way during the past month.

Dr. Bud Pass, noted 68XX author and owner of Computer Systems Consultants gave us a call with some suggestions for improving Ivan Helmrich's interrupt driven replacement for the CoCo OS-9 RS-232 module. Then, not more than 30 minutes after we returned from a two week vacation in Kansas, Brian Lantz called from Tampa, Fla. Wait till you see what he's been up to. UNIX systems, look out!

Additionally this month we'll pass along some assembly language tips and a mathematical benchmark written in both BASIC09 and C. That should keep you busy for one month.

(Dale L. Puckett is a free-lance writer and programmer who has worked with the Motorola family of microprocessors since 1976. He just completed his first book, The Official BASIC09 Tour Guide, *this summer. It has been published by Microware and was debuted at the Chicago* RAINBOWfest. *He is the author of* DynaSpell, Readtest, Esther *and* Help, *which are available from Frank Hogg Laboratories. He serves on the Info World Software Review Board and is a Chief Warrant Officer in the U.S. Coast Guard.)*

"Ser" Improvements

Dr. Pass noted that the new RS-232 module worked, but he thought you would be interested in these improvements. First, he feels the Baud rate constant for 600 Baud needs to be changed to $DF. To make that change, substitute the new line below for the old:

```
Old: B600 SET $DF
New: B600 SET $D8
```

A syntax error slipped into the listing that ASM did not catch. You would notice the problem if you tried to run a terminal that requires the X-ON and X-OFF protocol. Again substitute the New for the Old.

```
Old: LDA #$XONC
     LDB #$XOFFC
New: LDA #XONC
     LDB #XOFFC
```

In the routine named SLEEP, you should check for the task being killed. Bud added the check by inserting the following code after the call to F$SLEEP.

```
        LDX D.PROC
        LDB P$SIGNAL,X
        BEQ SLEEP90
        CMPB #$INTRPT
        BLS SLERR
SLEEP90 CLRA
        LDA P$STATE,X
        BITA #CONDEM
        BNE SLERR
        PULS D,X,PC
SLERR   LEAS 6,X
        COMA
        RTS
```

When Helmrich coded the original GETSTA routine, he set it up so that OS-9 would always return a "ready" indicator, whether or not the queue had any characters in it. Bud needed a valid ready indication to work with a terminal program he was getting ready for the market so he added five lines of code to GETSTA. Here's the new version:

```
GETSTA CMPA #1
       BNE BR12
       LDB INCNT,U Check Ready
       BNE BR13
       LDB #$E6      Not Ready
       ORCC #1
       RTS
BR13   CLRB
       RTS
```

Bud also pointed out that operation could be improved by checking to see if a NULL has been received. If so, the checks for the keyboard interrupt, keyboard abort and keyboard pause characters may be bypassed. Insert the following two lines between the first and second line of the routine SRIRQ0.

```
TSTA
BEQ SRIRQ1
```

Finally, Bud gave me some information about an undocumented change in some OS-9 serial drivers. He says that if there are characters in an input queue, the carry bit is cleared in response to a GETSTAT call. But, the B-register contains the number of characters in the queue, not zero, as specified in the manuals.

Computer Systems Consultants, 1454 Latta Lane, Conyers, GA 30207 hopes to have released their intelligent terminal program for CoCo OS-9 by the time you read this. I understand it will even give you the ability to reliably upload and download programs from the popular bulletin boards that use the CP/M XMODEM protocol. Thanks for the tips, Bud.

Assembly Language Tips

We have received many letters asking us to give some assembly language tips to beginners. To do this, I cut some pieces out of *DynaSpell.* We'll look at a routine at a time and see if we can help clear up a few of your questions regarding assembly language programs for OS-9. We assume that you have looked over the Radio Shack manuals and have a general idea of how the system works. We'll start at the beginning of a program. Fair enough?

```
  NAM SPELL
  IFP1
  USE /D0/DEFS/os9defs
  USE /D0/DEFS/li.equates
  ENDC

  TTL An OS-9 Utility to find misspelled words

prog MOD SPLEND,SPLNAM,PRGRM+OBJCT,REENT+1,SPELL,SPLMEM
  USE DPEQUATES

prvbuf rmb 32
lkbuf rmb 32
  rmb 255 room for stack
SPLMEM equ .

SPLNAM FCS /SPELL/
COMF1 FCS '/d0/spell/common.dat'
mywf1 fcs '/d0/spell/MYWORDS.DAT'
DICTF1 FCS '/D0/spell/DICTIONARY.DAT'
shlstr fcs 'shell'
dirstr fcc /dir/
  fcb $0D
  USE SPELL.STRINGS
  EMOD

SPLEND EQU *
```

The first line above tells ASM the name of the program. Several lines later, the pseudo operator TTL gives it some more information to print in the header of your listing.

Make special note of the lines that say, IFP1 ... ENDC. The IFP1 conditional tells ASM to use the lines between it and the ENDC if the assembler is on its first pass. That's why you don't see the "USE /D0/DEFS/OS9DEFS" line in listings that are output from ASM. The actual listing of the program is done during ASM's second pass.

The line with the label PROG is used to tell ASM how to set up the module header in your program. If you read a lot of OS-9 programs you'll notice that the MOD line in all programs is almost the same. Usually, only the name of the program you are reading has been changed. In a nutshell, SPLEND causes ASM to form a double byte equal to the length of the program. It's actually the offset from the beginning of the module to the label SPLEND. Remember, OS-9 programs always start at zero.

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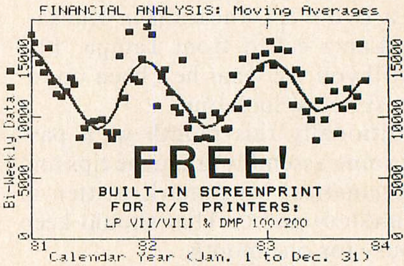

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Continuing across the line, SPLNAM forms two bytes holding the offset from the start of the module to the label, SPLNAM. A few single bytes follow that tell OS-9 what type of program it is, i.e., 6809 object code, BASIC09 I-code, etc.

Finally, at the end of the MOD line you'll see the labels SPELL and SPLMEM. SPELL causes ASM to form a double byte that contains the offset from the beginning of the module to the start of the executable code in the module and SPLMEM tells OS-9 how much memory the program needs to run.

Notice that with OS-9 you always use two memory areas when you run a program. One area contains the program, the other the data used by the program. Nothing in the program area can change during execution. That is why all variables must be defined and stored in the data area. The line, "SPLMEM EQU ." tells ASM that this is the end of the data area.

Lines containing the USE pseudo operator tell ASM to insert the code contained in the file named in place of the line. USE follows all standard OS-9 rules, i.e., if a filename only is given, it is assumed to be located in the user's current data directory. If a full pathlist is given, it will read the file using that pathlist.

Notice that since the DEFS files are most always located in the DEFS directory on device /D0, you usually need to use a full path list to reach them. The other USE lines in the code above are filenames only, therefore they are read from the current data directory. The source code to *DynaSpell* contains more than a dozen USE files.

Finally, notice the line containing the EMOD operator. It tells OS-9 that this is the end of the program and automatically generates the modules CRC and inserts it at this point in the object code. Let's look at some more code:

```
*
*CHARACTER EQUATES
*
BELL EQU 7
LF EQU $A
CR EQU $D
SPACE EQU $20
NULL EQU 0
```

This code is contained in a USE file I called DPEQUATES. The file holds the names and locations of all constants and variables in *DynaSpell*. This means that I can go into this one file and edit a single constant instead of editing the same constant everywhere it appears in a program.

After it has read the lines above, ASM will substitute the decimal number 7 every time it sees the word BELL. Likewise, it will put the value 10 decimal or A hexadecimal in the object code everytime it sees the word LF. Moving right along.

```
RDICST FDB RDILEN
       FCB CR,LF,LF
       FCC /DynaSpell is looking for
       your words in its dictionary./
RDILEN EQU *-RDICST-2
```

The code above shows you a handy way to define a string using ASM. The label RDICST marks the beginning of a string definition. When printed, it will display the words between the slashes on your terminal. The trick can be found at the label RDILEN. It computes the length of the string by subtracting the location of the beginning of the string and two additional bytes from its location. Notice also that this value is stored by the assembler at the label RDICST by the FDB pseudo operator. Okay, you say, but how do we print this string?

```
pstr pshs a,y
  ldy ,x++
  lda opath
  os9 I$writ
  lbcs error
  puls a,y,pc
```

This routine does the job. We call it with the 6809's X-register pointing to the location of the length of the string, RDICST in this case. Then, we must push the value of the A-register and Y-register on to the stack. We're going to need them later.

This done, we can load the Y-register with the length of the string. We do this by loading it with the value stored at an offset of zero from the X-register. Remember, we entered this routine with the X-register pointing to — or containing — the location of RDICST, the string length.

Notice now that when we loaded the length of the string in the Y-register we also incremented the X-register twice. This means that it is now pointing to the first character in our string. In this case that character is a carriage return.

We now load the OS-9 path number into the A-register and make a call to the operating system with the line, "OS9

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I$WRIT. If there is an error, OS-9 will return with the carry set and we go worry about it. Otherwise, we simply return by pulling the values of the two registers we stored and the program counter off the stack. The string will have been printed to the output path named in opath.

How do we get a single character from the standard input path — keyboard? How do we print a single character, a carriage return and line feed or, even a decimal number? Read on.

```
keyin pshs x,y,b,u
   bsr getchr
   pshs a
   puls x,y,b,a,u,pc

getchr pshs x,y
   leax chrbuf,u
   lda #0 standard input only
   ldy #1
   os9 I$read
   lbcs error
   lda chrbuf
   puls x,y,pc
```

First, to get a character we call the routine "keyin." It saves the required 6809 registers on the stack, gets a character from the routine "getchr," puts that character on the stack and returns by pulling all the registers including the program counter. The character is in the 6809's A-register when we return from "keyin."

"Getchr" shows how you set up a routine to get a single character from the standard input path. Remember, most of the time you can equate standard input path with keyboard. When you use the OS9 I$READ call, the X-register must point to a buffer in memory where you are going to store the character. The A-register must contain the path number.

Remember, the standard input path is always zero. Notice also that I$READ leaves the character stored at "chrbuf" so we must load it into the A-register before we return.

When you get a chance, check the description of the I$READ call in the manual — the Blue one — and you'll find that you can read any number of characters at a time. The number is put in the Y-register before the call. "Getchr" is a special case that reads only one character.

You can speed up your programs by reading or writing more than one character at a time. Let's take a look at a routine that puts out a single character.

```
* routine to output just one
* character to the standard output path

putchr pshs a,x,y
   leax chrbuf,u
   sta chrbuf
   lda opath
   ldy #1
   os9 i$writ
   lbcs error
   puls a,x,y,pc

pcrlf lda #cr
   lbsr putchr
   lda #lf
   lbra putchr hidden rts
```

The output routines are almost the direct opposite of the getchr routine. The only difference — they use the OS9 I$WRIT call instead of I$READ. "Pcrlf" gives you an easy way to output a carriage return and linefeed to the standard output path. The names of these routines should be familiar to FLEX programmers. Effectively they are OS-9 routines to emulate the equivalent FLEX subroutine calls. Here's a bonus for the month, a routine to put out a decimal number.

```
* Routine to output a decimal
* number from the d-register

outdec pshs a,b,x
   leax dectab,pcr
   clr ,-s
   clr ,-s
dec3 clr ,s
dec2 inc ,s
   subd ,x
   bhs dec2
   addd ,x++
   pshs a,b
   lda 2,s
   deca
   tfr a,b
   orb 3,s
   stb 3,s
   beq dec4
   adda #'0
   bsr putchr
dec4 puls a,b
   tst 1,x
   bne dec3
   leas 2,s
   puls a,b,x,pc

dectab fdb 10000,1000,100,10,1,0
```

Sometimes you will want to change the status of a device descriptor from within your assembly language program. For example, you may want to turn off the pause feature. Here's one way to do it.

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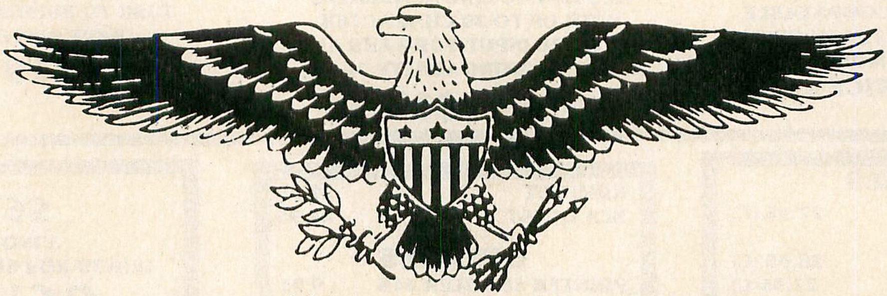

Color Micro Journal

The Color Computer Monthly Magazine

$1.95 per issue Vol. 1, Issue 2 October, 1983

THIS 'N THAT

The **BIG NEWS** this month is that **OS-9** has finally arrived for the Color Computer. The **ASTOUNDING** part of the Radio Shack OS-9 Package, besides the price, is the **DOCUMENTATION**. You 'Old Time Radio Shack Followers' will not believe what you see. Jon Shirley has been telling us that the main reason for the "lack" of documentation with a lot of their products was the restrictions placed on releasing that information by **Microsoft**; I

OS-9 on the COLOR COMPUTER

One of the "Operating Systems of the Future" is **now available** for the "little old Color Computer"; **OS-9.** Freely translated, OS-9 means "Operating System for the 6809" (OS-9 is now being written for the **68000**, also). Since it is fairly obvious that UNIX and "UNIX-Type" Operating Systems will be running on just about every computer to come out in the next few years, a whole new language is beginning to appear on the horizon.

Color Computer OS-9; the Package

We had been running a preliminary release of OS-9 on the Color Computer for a few weeks, and received the "Official Radio Shack" version for Review a couple of days ago. To put it mildly, this package is **IMPRESSIVE!** For $69.95 (Radio Shack Catalog Number **26-3030**), you receive a 9 1/2" x 7 5/8" x 2" package containing 4

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```
* get status packet
* and set -pause and -lf

   clra
   clrb
   leax stapak,u
   os9 i$gstt
   lbcs error
   lda 7,x get pause condition
   sta pausav
   clr 7,x set no pause
   lda 5,x get lf condition
   sta lfsav
   clr 5,x set no auto line feeds
   clra path number
   clrb write status packet
   os9 i$sstt setstat call
   lbcs error
```

The routine above uses OS-9's get status call to retrieve the table in memory that holds device descriptor data. You must tell it where to save the information. We put it in a buffer named stapak,u. Once we have the information stored in a buffer we can modify it.

First, we retrieved the pause condition and saved it so that we could restore everything to the same condition when we exit our program. We knew it was located at an offset of seven from the beginning of the table from reading the blue book.

Then, we set the pause location to -pause, or zero, with the "clr 7,x" instruction and did the same with the "lf" location. After storing the condition we wanted in our table we copied that table back into OS-9's table by setting up and issuing the I$sstt, or set status call.

That takes care of the initial table change. When we leave the program we must put everything back the way it was. Here's the way we did it during a normal exit from the program. Of course, we used a similar routine when we needed to exit because of an error.

```
done lbsr clrscn clear screen before
leaving
   leax stapak,u return pause
   lda lfsav and lf to prior
   sta 5,x condition before exiting
   lda pausav
   sta 7,x
   clra
   clrb
   os9 i$sstt do it!
   lbcs error
   clrb report no errors
   os9 f$exit
```

Have you ever wondered how you can call another program, i.e., start another OS-9 process from within one of your own assembly language programs? Study this routine.

```
* now do dir
   leax shlstr,pcr "shell"
   ldy #4 size
   leau dirstr,pcr "dir"
   lda #1 object code
   clrb
   os9 f$fork
   lbcs error
   os9 f$wait
```

The code above sets up a call to a shell that runs the OS-9 dir utility. DIR must be in memory or in your current execution directory when the code runs. The instructions that load the registers show how you tell OS-9's F$FORK what process you want to start. "Leax shlstr,pcr" points to a string in memory that holds the characters: s-h-e-l-l. The eighth bit is set on the last "l". This is how OS-9 knows that it is at the end of the name.

By the same token we point the U-register to the location of our parameter string — the name of the program we want our new shell to execute. In this case the string contains the letters, d-i-r, followed by a carriage return. You can find the actual strings in the first assembly code in this tutorial.

After we make the F$FORK call we tell *DynaSpell* to go to sleep and wait for our new shell to die. We do this with the OS9 F$WAIT call. Here's how it works. When the DIR command is finished the shell that ran it will die and send a signal to OS-9 to wake up the process that called it.

As we wrap up our assembly language tutorial we'll give you three more routines to ponder. Hopefully you'll learn how to check for and handle an end-of-file condition, open a file so you can write information to it and make simple menu selections.

```
eofchk cmpb #e$eof end of file?
   lbne error no, go
   lda ipath yes, close read file
   os9 i$clos
   lbcs error
   lda opath standard output?
   cmpa #1
   beq eofc1 yes, go
   os9 i$clos no, close it
   lbcs error
   lda #1 and set up for
   sta opath standard output
eofc1 deca and standard input
   sta ipath
   orcc #1 set carry to indicate
   puls x,pc exit needed

* Open a file for write
writon clr reflag
   leax filnam,u open file
   lda #read.
   os9 i$open
   sta ipath
writ1 leax temstr,pcr now open "temp"
   ldd #write.*256+updat.+pread.+
pwrit.
   os9 i$crea
   bcs wtemchk
   sta opath

*  A small segment from a menu selec-
     tion
* decision tree

chkff cmpa #'f want formatted read?
   bne chku     no, is character a "u"
   lbsr   reasty yes, do formatted read
   lbra query     and go back to main
menu
chku cmpa #'u want to use another
     dictionary?
   bne chko     no, see if want to quit
   lbsr use     yes, go to it
   lbra query   and return to main menu
chko cmpa #'o want to go back to oper-
ating system?
   bne chkfb  no, want to save accepted
     words?
   lbra done back to OS-9   yes, go back
chkfb cmpa #'b build new dictionary list
   bne chkfw
   lbsr savwrd
   lbra query   and the beat goes on
```

More Benchmarks

The following procedures show you the similarity between a BASIC09 program and a C program. They also show you the speed difference between two programs running on the same machine.

Since BASIC09 is interactive it is a handy tool to use to develop an algorithm. Once the program flows smoothly, you can recode it in C and pick up the speed, etc.

The routines came from Tim Grovac who rewrote them from a *Byte* magazine published last year. First, let's look at the run times. The BASIC09 procedure below takes 86 seconds to run on a Color Computer, 39 seconds on a GIMIX Level II system running at two megahertz. The C code executed in 33 seconds on my Color Computer. It took only 15 seconds on the GIMIX.

How do we stack up to the CP/M crowd? When Tim ran the same procedure on a four megahertz Compustar

The Rainbow's Second Annual

SIMULATION CONTEST

Because of the immense popularity of Simulations and the superior quality of the programs submitted in last year's competition, THE RAINBOW has announced plans for the Second Annual Simulation Contest.

Last year, our contest judges relived the Civil War, traveled to the moon, to Mars and beyond, went bankrupt running a restaurant, made a million bucks as a manufacturer, survived a flood, lobbied for bills in Congress, assumed responsibility for mid-air collisions as an air-traffic controller, drowned while learning to sail, experienced the thrill of victory in the seventh game of baseball's World Series, and made it big with our own software business. (Many of the entries in the 1983 contest are featured in a book on Simulations, which THE RAINBOW plans to publish in early fall.)

We're looking for an even greater variety of situations this year and expecting to see great improvements in graphics presentations because of the advancements in programming tools and knowledge since the first contest.

Many of THE RAINBOW's generous advertisers will be donating some exciting prizes as they did last year (and in our recent Adventure contest) when our winners carted off Radio Shack disk drives, an Epson printer, and dozens of other prizes that included a wide variety of peripherals and high quality software. Among those companies donating prizes:

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Contest submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We really do not have the time to key in programs, obviously. All entries should be supported by some editorial commentary, explaining how the program works and loads. Please do not submit entries that are currently submitted to another publication.

Your entry must be received by THE RAINBOW no later than September 1, 1984, to be eligible for the competition.

This promises to be the THE RAINBOW's most exciting contest yet, and, as usual, the winning entries will be published when we announce the results in an upcoming issue.

RULES: All programs must be original works, no "conversions." Entries must be postmarked by September 1, 1984, and become the property of Falsoft, Inc., publisher of THE RAINBOW. Decision of the judges is final. Duplicate prizes will be awarded in the case of ties. Winning programs to be featured in a special RAINBOW Simulation issue. Mark entries "Simulation Contest Editor" and send to THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

Z80 CPU it took 33 seconds. The same machine ran a JRT PASCAL version in 131 seconds. There's something you can talk about at your next computer club meeting. Here is the code:

```
PROCEDURE benchmark

0000  (* A short Math Benchmark rou-
      tine *)
0024  DIM x,j,k: INTEGER
0033  FOR x=1 TO 10000
0044    j=240
004B    k=15
0052    j=k*(j/k)
0062    j=k*(j/k)
0072    j=k+k+k+k+k+k+k+k+k+k+
        k+k+k+k+k+k
00B6    j=j-k-k-k-k-k-k-k-k-k-k-k-k-
        k-k-k
00FA  NEXT x
0105  END
```

And, in C.

```
/* Math Benchmark routine in "C" */
int j,k,i;
main()
  (
  for (i=1; i<10000; i++)  {
   j=240;
   k=15;
   j=k*(j/k);
   j=k*(j/k);
   j=k+k+k+k+k+k+k+k+k+k+k+
     k+k+k+k+k;
  k=j-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k;
    }
  }
```

NineCom Update

Here's an update on *NineCom*. Ken tells me that this program is designed to run on the new deluxe Color Computer that should be in your local Radio Shack by the time you read this column. Reportedly, the new CoCo has a 6551 ACIA port built in and *NineCom* uses it. *NineCom* will not run on the original RS-232 port. The drivers for the new ACIA port will be in a new release of OS-9 to hit the stands soon.

UNIX Look Out!

We've saved the best for last. We mentioned at the beginning of this column that Brian Lantz was a genius. Now, we'll prove it. First, his strategy.

Brian examined all the OS-9 toolkits that had been released earlier in the year. Then, he checked the list of standard UNIX utilities. He decided that there was really no need to reinvent the wheel so he struck out to break new ground and fill the gap between utilities available on UNIX and OS-9.

In the past several months he has moved us 36 utilities closer. Ken Kaplan should put him on the payroll. About a dozen of the utilities will be marketed by Paul Searby at Computerware. The remainder will be added to the FHL lineup soon.

We won't be able to go into a lot of detail this month because we're still testing and we're out of space, but in a nutshell, Brian's programs all obey the UNIX conventions. Each one of his OS-9 utilities uses the same command line and does the same thing as its UNIX equivalent. He did them in assembly language so they are also an order of magnitude shorter than the UNIX versions which are written in C.

These tools recognize the meta characters and regular expressions we wrote about the toolkit from Microware. In fact, Brian has added a utility called META that preprocesses meta characters for commands that don't recognize them. For example, you use these command lines:

```
OS9: meta del test* <ENTER>
OS9: meta list /d0/LISTINGS/e*
<ENTER>
```

If you type meta <ENTER> you enter a meta shell.

Here's a listing of some of the others. We'll try to add more details and a review in a future column.

AT	set up a procedure file AT a future date and time
ATRUN	run a procedure file set up by AT
CAL	print a calendar of any year
CAT	copy input from stdin, concatenate it to stdout
CHECK MAIL	tells you when you have mail
CHMOD	changes attributes of file or directory
CHOWN	changes ownership of a file
COMM	compares two files
CONFERENCE	stdin goes to selected users on line
CRON	run tasks periodically
CRYPT	encrypt standard input to standard output
DU	check usage of disk space
ERROR	list error message
EXPAND	add input from stdin to a "pathname"
FGREP	Fast Grep to find strings in a file
FINGER	find information about users on line
HEAD	print first few lines of file
LOGIN	similar to Microware's, checks for mail
LOWER	convert UPPER case letters to lower
LS	Lists filenames, accepts meta characters
MAIL	Send and receive mail from user to user
MAN	On line system manual
META	expands meta characters from command line
MV	moves file
PACK	compresses spaces in file
PASSWD	change and encrypt login password
PR	format stdin to standard output
QSORT	quick sort, requests memory when needed
RPL	replaces one string with another
SND	output tone on CoCo speaker
SOUND	same as SND
SU	Switch Users without LOGIN
TAIL	display last NUM lines of a file
TEE	UNIX equivalent, overwrites existing file
TIME	execute and time a command
TR	substitute, compress and delete characters
TTY	Display name of standard input device
UDATE	display current date and time, UNIX format
UNIQ	reduce multiple, consecutive lines to one unique line
UNPACK	puts spaces PACKed back in
UPPER	converts lower case letters to UPPER case
UPS	Repeatedly process a command
VIS	display non printing characters as /nnn
VOICE	adds system call for SOUND
WALL	write file to all users on system
WC	word count utility
WHO	tells who is on system and where they are logged on
WRITE	write message to a specific user

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in THE RAINBOW's Scoreboard column. All entries must be received by the first of the month to be eligible for the following month's Scoreboard. They must include your *full* name, address, game title, company name and, of course, your high score. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o THE RAINBOW.

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1,571,300	Jeff Weaver, Gordonville, PA
1,400,200	James Stevenson, Marshall, TX
999,900	Andre Wagner, Bangor, PA
615,500	Randy Hankins, Tabor, FL
212,800	Mike Trisel, Willshire, OH
126,500	Matt Corwine, Michigan Valley, KS
CASHMAN *(MichTron)*	
$19,650	★Perry Denton, New Baden, IL
$16,000	Scott Oberholtzer, Lexington, MA
$11,130	Ricky Susfalk, Grand Island, NY
$10,000	Tim Brown, Clio, MI
CAVERN COPTER (THE RAINBOW)	
747	★Susan Ballinger, Uxbridge, Ontario
CHAMELEON *(Computerware)*	
15,100	★Janell Stroshane, Ashland, WI
CHOPPER STRIKE *(MichTron)*	
67,900	★Matt McCann, Louisville, KY
63,000	Andrew Figel, Sardis, OH

47,400	David Figel, Sardis, OH
42,100	Brian Peterson, Muskegon, MI
CLOWNS & BALLOONS *(Radio Shack)*	
110,475	★Andrew Truesdale, Ferguson, MO
104,270	Ken Bird, Delaware, OH
92,480	Martin Careau, Quebec City, Quebec
89,430	Perry Denton, New Baden, IL
88,900	Cheryl Pratt, Moab, UT
COCO TREK *(Chromasette)*	
2,500,000	★Ted Warren, Morgan, ID
COLOR OUTHOUSE *(MichTron)*	
528,694	★Benjamin Hebb, Bridgewater, Nova Scotia
160,200	David Lazar, Englishtown, NJ
101,650	Davey Devlin, Clyde, NC
69,848	Phillip Laurell, Lansing, MI
48,663	Bruce March, Barrie, Ontario
42,182	Bernd Pruetting, Scheibenhardt, West Germany
COLORPEDE *(Intracolor)*	
10,001,051	★Mark Smith, Santa Ana, CA
3,355,248	Scott Drake, Pine City, NY
2,614,230	Jerry Petkash, Warren, MI
2,547,299	Rich McGervey, Morgantown, WV
2,471,342	Vincent Lok, Ontario, Canada
1,054,348	Randall Edwards, Dunlap, KS
295,789	Jon Kroll, Greendale, WI
224,450	Ellen Ballinger, Uxbridge, Ontario
CRASH *(Tom Mix)*	
155,000	★David Lazar, Englishtown, NJ
CU*BER *(Tom Mix)*	
196,090	★Randall F. Edwards, Dunlap, KS
94,940	Martin C. Klein, Skokie, IL
49,510	Doug Kleir, Grand Rapids, MI
42,850	Mike Schwartz, Otsego, MI
38,180	Kevin Schwartz, Otsego, MI
36,960	Blossom Mayor, E. Greenbush, NY
CUBIX *(Spectral Associates)*	
67,400	★Patricia Lau, York, PA
45,056	Bonnie Kretschmer, Oxford, OH
38,500	Randall Edwards, Dunlap, KS
28,760	Michael Rosenberg, Prestonsburg, KY
27,780	Britt Landrum, Pensacola, FL
DANGER RANGER *(Med Systems Software)*	
1,962	★Michael Rosenberg, Prestonsburg, KY
1,890	Fred Thompson, Saugus, MA
DEFENSE *(Spectral Associates)*	
103,660	★Mary A. Brickles, Allen Park, MI
DESERT GOLF *(Spectral Associates)*	
31	★Kenton Fifield, Fort Francis, Ontario
DEVIL ASSAULT *(Tom Mix)*	
1,762,980	★Michael Rosenberg, Prestonsburg, KY
1,294,300	●John Statham, Strathroy, Ontario
625,000	Simon Dickson, Bangor, N. Ireland
318,550	Kanti Dinda, Kingston, Ontario
294,300	Chip Lilley, Finleyville, PA
289,300	Michael Rosenberg, Prestonsburg, KY
271,106	Peter Niessen, Carlisle, MA
DOODLE BUG *(Computerware)*	
3,149,330	★Eiko Cary, National City, CA
2,577,515	●Tim Brown, Clio, MI
1,767,630	Perry Denton, New Baden, IL
109,660	Byron Albertson, Williams Lake, British Columbia
DOUBLE BACK *(Radio Shack)*	
1,125,000	★Mark Hurst, Sheridan, OR
1,080,000	Phillipe Duplanties, St. Jerome, Quebec
605,890	Peter Sherburne, Highland, CA
474,040	Paul Moritz, Butte, MT
435,570	Phillippe Morsan, St. Jerome, Quebec
DRACONIAN *(Tom Mix)*	
71,930	★Michael Corman, W. Layfayette, IN
DUNKEY MUNKEY *(Intellectronics)*	
1,015,000	★Kyle Keller, Overland Park, KS

EL BANDITO *(Mark Data)*	
955	★Michael Rosenburg, Prestonsburg, KY
ELECTRON *(Tom Mix)*	
45,510	★John Sandberg, Concord, CA
41,750	Michael Rosenberg, Prestonsburg, KY
22,990	Alan Morris, Chicopee, MA
19,500	Robby Presson, Florissant, MO
FIRE COPTER *(Adventure International)*	
97,390	★Sam Hughes, Colton, CA
78,860	●Woody Farmer, Acme, Alberta
FLYBY *(Chromasette)*	
104,980	★David Finberg, Annandale, VA
28,910	Ron Suedersky, Universal City, TX
20,110	Rick Mansell, Calgary, Alberta
16,670	Michael Rhattigan, Cory, NC
4,830	Jeff Roberg, Winfield, KS
FOOTBALL *(Radio Shack)*	
217-0	★Glen Giacomelli, Woodbridge, Ontario
THE FROG *(Tom Mix)*	
452,800	★James Baker, Salt Lake City, UT
118,200	Ray Boyko, Whitby, Ontario
109.500	Pat Craddick, Janesville, WI
95,790	Eileen Kaakee, Royal Oak, MI
68,850	Scott Kubota, Whitby, Ontario
FROGGIE *(Spectral Associates)*	
84,440	★Bill Ide, Newark, DE
74,050	Mike Garozzo, Morrisville, PA
68,680	Carmen Thew, Surrey, British Columbia
GALAGON *(Spectral Associates)*	
286,741	★Rod Moore, Fork Union, VA
188,130	Daryl Judd, Nampa, ID
136,510	Mike Ashworth, Huntington, WV
113,900	Graham Baird, York Haven, PA
95,600	Kyle Keller, Overland Park, KS
GALAX ATTAX *(Spectral Associates)*	
253,900	★Shawn McAlpin, Louisville, KY
113,650	Darrin Filand, WA
104,550	Mitch Hayden, Univ. of Minn.
82,650	Steve Hargis, Tucson, AZ
74,550	John Gosselin, Campbell River, British Columbia
GHOST GOBBLER *(Spectral Associates)*	
1,007,430	★Todd Brannam, Charleston Hts., SC
825,250	Randy Gerber, Wilmette, IL
423,390	Rich McGervey, Morgantown, WV
255,000	John Osborne, Kincardine, Ontario
228,290	Patricia Lau, York, PA
51,750	Wendy Weinschenk, Wickenburg, AZ
GONE FISHING (THE RAINBOW)	
8	★Jeffrey Kocks, Grove City, OH
GRABBER *(Tom Mix)*	
129,100	★Blossom Mayor, E. Greenbush, NY
70,600	Michael Corman, Lafayette, IN
HEIST (THE RAINBOW)	
1,500	★Andy Dater, Medford, OR
1,300	●Richard King, Houston, TX
INTERGALACTIC FORCE *(Microdeal)*	
254,650	★Christopher T. Grey, Hollywood, CA
113,600	Alex Taylor, Manchester, England
JUNIOR'S REVENGE *(Computerware)*	
3,007,000	★Tim Brown, Clio, MI
2,154,900	Scott Kubota, Whitby, Ontario
2,099,300	Shawn McAlpin, Louisville, KY
1,115,300	Ryan Van Manen, Grand Rapids, MI
1,081,700	Bruce March, Barrie, Ontario
223,900	Patrick Kochaniec, Windsor, Ontario
KATERPILLAR ATTACK *(Tom Mix)*	
31,672	★Scott Fairfield, Williamstown, MA
25,949	James A. Lafare, Williamstown, MA
18,949	Vadim Gotovsky, Toronto, Ontario
15,821	Alex Gotovsky, Toronto, Ontario
5,426	Russ Rosen, Cardiff, CA

SCOREBOARD

KEYS OF THE WIZARD *(Spectral Associates)*	
662	★Susan Ballinger, Uxbridge, Ontario
662	★Pegi Tindle, Soquel, CA
662	★Ellen Ballinger, Uxbridge, Ontario
THE KING *(Tom Mix)*	
10,000,100	★Mark Smith, Santa Ana, CA
4,040,300	Andy Truesdale, Ferguson, MO
3,343,000	Corey Friedman, Minnetonka, MN
2,410,200	Candy Harden, Birmingham, AL
2,367,900	Richard Lacharite, Sherbrooke, Quebec
198,100	Simon Dickson, Bangor, N. Ireland
134,700	Blossom Mayor, E. Greenbush, NY
KLENDATHU *(Radio Shack)*	
1,245,821	★John Sandberg, Concord, CA
1,182,685	David L. Ferris, Shickshinny, PA
770,521	Ellen Ballinger, Uxbridge, Ontario
KRON *(Oregon Color Computers)*	
224,080	★Steve & Scott Schneider, OR
73,530	Christopher Porter, Naranja Lakes, FL
LADY BUGGY	
36,980	★Tony Cummings, Abington, MA
LANCER *(Spectral Associates)*	
2,797,450	★Randall Edwards, Dunlap, KS
2,354,000	Alex State, Las Vegas, NV
875,150	Larry Capen, Folsom, CA
736,250	Sharon Casten, Folsom, CA
617,500	Donna Willoughby, Brookfield, IL
LASERWORM & FIREFLY *(*THE RAINBOW*)*	
94,748	★Brian Chafin, Weyers Cave, VA
54,672	●Michael Rosenberg, Prestonsburg, KY
43,420	Eric Morrell, Sayreville, PA
37,250	Rene Belisle, Montreal, Quebec
29,872	Theodore Latham Jr., Rich Square, NC
LUNAR ROVER PATROL *(Spectral Associates)*	
162,100	★Sara Aliff, Northeast, MD
154,650	Tom Aliff Jr., Northeast, MD
98,500	Ima Wong, Williamstown, WV
66,900	Wayne Johansen, Rocanville, Saskatchewan
66,850	Randall Edwards, Dunlap, KS
44,100	Jefferson Hatch, West Chester, PA
MADNESS & THE MINOTAUR *(Radio Shack)*	
240	★Pegi Tindle, Soquel, CA
MARATHON *(*THE RAINBOW*)*	
101,520	★David Dean, West Mansfield, OH
71,550	Larry Evans, Elk Grove Village, IL
55,110	Michael Rhattigan, Cory, NC
MEGA-BUG *(Radio Shack)*	
60,000	★Robin Worthem, Milwaukee, WI
18,902	John Tiffany, Washington, DC
15,999	Ed Mitchell, Ragged Mountain, CO
14,297	Aleisha Hemphill, Los Angeles, CA
11,894	Paschal Wilson, Kentwood, LA
5,493	Brian Chafin, Weyers Cave, VA
MEGAPEDE *(Computerware)*	
72,937	★Joe Sannucci, Elizabeth, NJ
METEORS *(Spectral Associates)*	
26,580	★Kevin Endlich, Perry Hall, MD
14,200	Craig Dutton, Goose Bay, Labrador
MONSTER MAZE *(Radio Shack)*	
650,530	★Bruce March, Barrie, Ontario
533,450	John Hankerd, Gaines, MI
495,850	Andrew Mitchell, Melbourne, Australia
300,000	James Stevenson, Marshall, TX
MOON SHUTTLE *(Datasoft)*	
113,642	★Rod Moore, Fork Union, VA
MR. DIG *(Computerware)*	
223,600	★Tommy Wald, Minneapolis, MN
207,800	Phillip Laurell, Lansing, MI
40,350	Barney A. Sadler, Northwood, ND
MS. GOBBLER *(Spectral Associates)*	
22,680	★Oliver Banta, Lincoln, NE
MUDPIES *(MichTron)*	
156,800	★Glenn Wasson, Castleton, NY
147,400	Chris Hafey, Auburn, CA
124,400	Bernd Pruetting, Scheibenhardt, West Germany
18,500	Steve Springer, Louisville, KY
NINJA WARRIOR *(Programmer's Guild)*	
106,300	★Bud Seibel, Tumbler Ridge, British Columbia
102,400	Christopher Gelowitz, Claresholm, Alberta
75,300	Brad Gaucher, Hinton, Alberta
46,400	Daniel Milbrath, Ann Arbor, MI
36,800	Greg Lowry, Davisburg, MI
PAC-ATTACK II *(Computerware)*	
214,210	★Ray Boyko, Whitby, Ontario
189,350	Scott Kubota, Whitby, Ontario
56,014	Lisa Welte, Baxter, TN
30,150	Jeff Weaver, Gordonville, PA
PAC 'EM *(*THE RAINBOW*)*	
1,934	★Dr. James Peterson, Radcliff, KY
1,870	Steve Olson, Calgary, Alberta
1,572	Kenneth Bergenham, Lawton, MI
1,556	Rupert Young, Sheffield, MA
669	Jeff Loeb, Mobile, AL
429	Susan Ballinger, Uxbridge, Ontario
PAC-TAC *(Tom Mix)*	
129,770	★Andrew Lehtola, Mound, MN
100,630	David Dean, West Mansfield, OH
61,025	John Tyson, Superior, WI
PHANTOM SLAYER *(Med Systems Software)*	
2,668	★Michael Brooks, Glade Spring VA
2,488	Troy Messer, Joplin, MO
1,852	Curtis Boyle, Saskatoon, Saskatchewan
1,306	Marc Hassler, Gainesville, FL
1,126	Gille Giroux, North Bay, Ontario
858	Susan Ballinger, Uxbridge, Ontario
PINBALL	
2,800,090	★Glen Ewing, Brooklin, Ontario
PIPELINE *(*THE RAINBOW*)*	
1,110	★Roger Buzard, Lima, OH
1,062	Kent Prehn, Carol Stream, IL
1,030	Anita Howe, Jackson, NJ
838	Johnny Fritsch, Whitehall, PA
793	Bill Fritsch, Whitehall, PA
PLANET INVASION *(Spectral Associates)*	
177,900	★Russ Rosen, Cardiff, CA
POLARIS *(Radio Shack)*	
63,053	★Paschal Wilson, Kentwood, LA
POOYAN *(Datasoft)*	
890,850	★Jerry Morgan, Independence, MO
480,450	Bernd Pruetting, Scheibenhardt, West Germany
279,450	●Chip Lilley, Finleyville, PA
273,450	Davey Devlin, Clyde, NC
249,900	Erika Oldale, Athabasca, Alberta
220,950	Daniel Belisle, Montreal, Quebec
216,200	Templar Beaton, Coleman, Alberta
167,150	Fred Thompson, Saugus, MA
98,000	Andy Dater, Medford, OR
POPCORN *(Radio Shack)*	
43,970	★Jeff Weaver, Gordonville, PA
39,470	Nicole Freedman, Wellesley, MA
36,210	Brad Gray, Olive Branch, MS
33,910	Wendy Weinschenk, Wickenburg, AZ
32,000	Lisa Welte, Baxter, TN
12,000	Brian Chafin, Weyers Cave, VA
PROJECT NEBULA *(Radio Shack)*	
1,120	★John Hopkins, Greenville, SC
1,065	William Daley, Biloxi, MS
1,065	Dan Heater, Cortland, OH
995	Dan Bovey, Wheaton, IL
960	Ian Clark, Albion, MI
PYRAMID *(Radio Shack)*	
220/147	★Ssg. Danial Pierce, APO San Francisco, CA
220/224	Tony & Hazel Rye, Ingleside, Ontario
220/236	Pat McWhinney, Key Largo, FL
220/289	Douglas G. Oxenreider, Montevideo, MN
220	Jerome Galba Jr., Rochester, MI
200	Dale Roman, Bellaire, OH
Q-NERD *(*THE RAINBOW*)*	
27,800	★Richard King, Houston, TX
3,740	Theodore Latham Jr., Rich Square, NC
2,380	Jeff Loeb, Mobile, AL
RAAKA-TU *(Radio Shack)*	
40	★David Joyner, Raleigh, NC
RAINBOW ROACH *(*THE RAINBOW*)*	
124,800	★Cheryl Endlich, Perry Hall, MD
113,500	Andrew Smith, Columbia, SC
102,000	John Statham, Strathroy, Ontario
69,600	Bill Grubbs, Columbus, IN
49,000	Catherine Collingwood, Greenville, SC
REACTOIDS *(Radio Shack)*	
931,395	★Linda Mobbs, Pt. Huron, MI
203,800	Andrew Lehtola, Mound, MN
88,615	Robbie Anderson, Monrovia, CA
41,100	Jeff Loeb, Mobile, AL
RETURN OF THE JET-I *(ThunderVision)*	
372,782	★Roger Buzard, Lima, OH
148,112	Matt Griffiths, Stilwell, KS
135,306	Peter Niessen, Carlisle, MA
ROBOTTACK *(Intracolor)*	
2,216,950	★Randy Hankins, Tabor, IA
1,922,200	Erik Merz, Noblesville, IN
1,512,200	Robert Kiser, Monticello, MS
1,424,300	John Osborne, Kincardine, Ontario
1,219,810	Steve Skrzyniarz, Tacoma, WA
SANDS OF EGYPT *(Radio Shack)*	
82	★Shawn Hobbs, Hutchinson, KS
82	★John Allocca, Yonkers, NY
87	Kim Van Camp, State Center, IA
106	Sean Haynes, Naples, ME
SCARFMAN *(Cornsoft)*	
412,050	★Michael Cerami, Springfield, VA
253,920	●Scott Boulanger, Columbus, OH
SEA DRAGON *(Adventure International)*	
430,200	★David Lazar, Englishtown, NJ
137,500	Peter Niessen, Carlisle, MA
75,750	Steve Schweitzer, Sewell, NJ
60,430	Steve Skrzyniarz, Tacoma, WA
56,760	Alan Morris, Chicopee, MA
SEA QUEST *(Mark Data)*	
140	★Shawn Hobbs, Hutchinson, KS
230	Casey Stein, Binghamton, NY
SHARK TREASURE *(Computerware)*	
245,000	★Manon Bertrand, Hauterive, Quebec
175,000	Maurice Boyle, Saskatoon, Saskatchewan
SHOOTING GALLERY *(Radio Shack)*	
120,640	★Robert J. Wallace, Waldorf, MD
59,520	Vernell Peterson, Radcliff, KY
44,870	Mark Nichols, Birsay, Saskatchewan
44,480	R. Duguay, St. Bruno, Quebec
31,340	Martin Peterson, Lynchburg, VA
SKIING *(Radio Shack)*	
12.08	★Kelly Kerr, Wentzville, MO
13.73	Janell Stroshane, Ashland, WI
21.35	Jean-Claude Taliana, Brossard, Canada
29.52	Andrew Truesdale, Ferguson, MO
44.02	Brad Gaucher, Hinton, Alberta
SLAY THE NEREIS *(Radio Shack)*	
328,521	★Edward Meyer, Vancouver, British Columbia
SNAIL'S REVENGE *(*THE RAINBOW*)*	
34,860	★Michael Rosenburg, Prestonsburg, KY
11,380	Varunee Turner, Kamloops, British Columbia
9,230	Jose Cacho, Ft. Knox, KY
6,880	Rupert Young, Sheffield, MA
6,150	Alan Sadler, Northwood, ND
SOLO POKER *(Radio Shack)*	
910	★Carol D. Fitzgerald, Moscow, ID
850	Granville Bonyata, Tallahasse, FL
740	Allan Mercurio, Portsmouth, RI
SPACE ASSAULT *(Radio Shack)*	
1,632,450	★Walter Brokx, Granisle, British Columbia
537,200	Martin Careau, Quebec City, Quebec
358,660	Mike Snelgrove, Oshawa, Ontario
354,860	Bruce Madariaga, College Park, MD
238,580	John Cole, King City, Ontario
SPACE INVADERS *(Spectral Associates)*	
4,862,040	★F.U. Ingham, Clyde, WI
36,960	Sean Dutton, Goose Bay, Labrador
12,760	John McJilton, Houston, TX
SPACE RACE *(Spectral Associates)*	
60,125	★Mark Nelson, Kent, WA
37,600	Michael Rosenberg, Prestonsburg, KY

MORE... RAINBOW SCOREBOARD

SPACE SHUTTLE *(Tom Mix)*

595	★Steve Schweitzer, Sewell, NJ
585	Kenton Fifield, Fort Francis, Ontario
585	Randall F. Edwards, Dunlap, KS
576	David J. Banks, Greendale, British Columbia
575	Fred Weissman, Brookline, MA

SPACE WAR *(Spectral Associates)*

400,190	★Mark Felps, Bedford, TX
365,550	Randall Edwards, Dunlap, KS
116,000	Peter Niessen, Carlisle, MA
52,380	Jim Baker, Florissant, MO
15,420	Mark Nelson, Kent, WA

SR-71 *(Tom Mix)*

4,443	★Jay Johnson, Puyallup, WA
2,570	Dominique Hall, Williamstown, WV

STARBLAZE *(Radio Shack)*

10,000	★Dan Burner, Fowler, IL
9,050	Judith Simon, Warrendale, PA
8,000	Lee Van Dyke, Lansing, MI
7,350	James Hawerbier, Elmhurst, IL
6,850	Jonathan Judge, Oconto, WI

STAR TREK *(Adventure International)*

95	★Granville Bonyata, Tallahassee, FL
94	John Brackett, Chicago, IL

STORM ARROWS *(Spectral Associates)*

168,000	★Steven Ohsie, Deer Park, TX
136,650	Brian Specht, Rochester, NY
68,400	Jim Irvine, Sudbury, Ontario

TIME BANDIT *(MichTron)*

243,620	★Mark Wooge, Omaha, NE
129,240	●Brian Larrson, Fridley, MN
110,220	Sally Naumann, Hailey, ID
106,720	Glen Heidebrecht, Topeka, KS
66,700	Fred Naumann, Hailey, ID
21,570	Andy Van Dijk, Barrie, Ontario
15,340	Rosa Maria Paparis, Williamsburg, VA
8,640	Demetra Palantzas, Williamsburg, VA

TRAILIN' TAIL (THE RAINBOW)

76,275	★Michael Rosenberg, Prestonsburg, KY
33,454	Kenneth Bergenham, Lawton, MI
26,640	Dr. James Peterson, Radcliff, KY
24,415	Kentong Fifield, Fort Frances, Ontario

TRAPFALL *(Tom Mix)*

114,322	★David Joyner, Raleigh, NC
113,408	●Rich Trawick, N. Adams, MI
112,596	Kanti Dinda, Kingston, Ontario
112,404	Russ Rosen, Cardiff, CA
106,620	Simon Dickson, Bangor, N. Ireland
106,296	Brennan Baybeck, Traverse City, MI
104,456	Robert Cattral, Ottawa, Ontario
104,368	John Osborne, Kincardine, Ontario

TRIPLE YAHTZEE *(Software Factory)*

2,319	★Betty Gable, Poulsbo, WA

TUBE FRENZY *(Aardvark)*

544,560	★Perry Denton, New Baden, IL
240,060	Randall Edwards, Dunlap, KS
230,000	Ken Felix, Crystal Lake, IL
101,650	Lloyd Albertson, Williams Lake, British Columbia

TUT'S TOMB *(Mark Data)*

158,000	★Chris Russo, Miami, FL
106,460	Eileen Kaakee, Royal Oak, MI
104,360	Gary Marshall, Layton, UT
98,600	George Kaakee, Royal Oak, MI
84,420	Oliver Banta, Lincoln, NE
84,320	Mickey McCafferty, Oceanside, CA
82,000	Allen Bifano
78,280	Richard Shelton, Bakersfield, CA
71,160	Paul Rumrill, Gales Ferry, CT
41,060	Guy Silliman, High Bridge, NJ

VENTURER *(Aardvark)*

6,718,200	★Kyle Keller, Overland Park, KS
4,126,200	Greg Scott, Orlando, FL
2,657,350	Brian Panepinto, Spencerport, NY
2,291,100	Mike Sitzer, Roslyn, NY
1,769,400	Todd Hauschildt, Red Wing, MN

WACKY FOOD *(Arcade Animation)*

105,100	★Stephane Asselin, Hauterive, Quebec

WHIRLYBIRD RUN *(Spectral Associates)*

516,450	★Dan Shargel, Arroyo Grande, CA
283,100	Nathan Russell, Minco, OK
157,000	Hughens Bien-Aime, Montreal, Quebec
103,900	Dann Fabian, Crestview, FL
98,400	Dave Lubnow, Sussex, NJ
91,850	David Joyner, Raleigh, NC
64,000	Russ Rosen, Cardiff, CA

WILDCATTING *(Radio Shack)*

110,579	★Nicholas Siclari, Staten Island, NY
63,723	Michael Rosenberg, Prestonsburg, KY
48,682	David Rodgers, Carbondale, IL
38,318	Ellen Ballinger, Uxbridge, Ontario
34,828	Kerri Dutton, Goose Bay, Labrador

ZAKSUND *(Elite Software)*

1,256,000	★Robert Conyer, Willingboro, NJ
1,128,050	Richard Minton, West Frankfort, IL
1,008,100	Andy Mickelson, Granville, OH
950,500	Michael Rothman, Solon, OH
910,000	Steve Schweitzer, Sewell, NJ

ZAXXON *(Datasoft)*

1,510,000	★James Quadrella, Brooklyn, NY
401,900	Mike Hughey, King George, VA
370,400	Chris Coyle, Selden, NY
260,600	Roger Buzard, Lima, OH
235,200	Rich McGervey, Morgantown, WV
140,200	Matthew Connoly, Merrick, NY
116,100	Billy Connoly, Merrick, NY
115,500	Michael Cerami, Springfield, VA
113,900	Paul Elchlepp, U.S.S. Enterprise
104,600	Jimmy Connoly, Merrick, NY

ZEUS *(Aardvark)*

89,100	★Mike Schwartz, Otsego, MI
69,900	Kevin Schwartz, Otsego, MI
62,800	Brian Schwartz, Otsego, MI

— Kevin Nickols

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

HISTORY LESSON

Scoreboard:

Lately it seems that there are more and more letters printed concerning the game *Pyramid*. I, too, have reached the 220 mark in this game and I think that I know a few things that your readers might find interesting. No, not more hints; this time let's talk about history.

The game *Pyramid* is taken almost word for word from the original Adventure game called, appropriately enough, *Adventure*. *Adventure* was written by Will Crowther and Don Woods in FORTRAN and placed into the public domain in 1975. The game spread to many universities through ARPAnet, one of the first computer networks. It became so popular and was taking up so much time on some university computers that it was banned or restricted.

Since then, scores of versions of the original have appeared in many different languages and for many different computers. *Pyramid* only contains about half of the rooms of the original (which takes approximately 48K), but it still incorporates most of the game's toughest puzzles (with the sad exception of the friendly bear).

CoCo users who have enjoyed *Pyramid* might want to check with users groups for a complete version of *Adventure*. Those with 64K and CP/M can get a copy from The Software Toolworks, from whom I got much of this information.

Steve Hicks
Raleigh, NC

Scoreboard:

I am having a little trouble on the Adventure game *Pyramid*. I can only get the following treasures: an emerald, a jewel-encrusted key, a gold nugget, a few diamonds, a few silver bars, precious jewelry and a nest full of golden eggs for a total of 160 points. If anyone has any hints or clues on finding the rest of the treasures or how to open the sarcophagus, please send them to me at 55 Joanne Road, 02072.

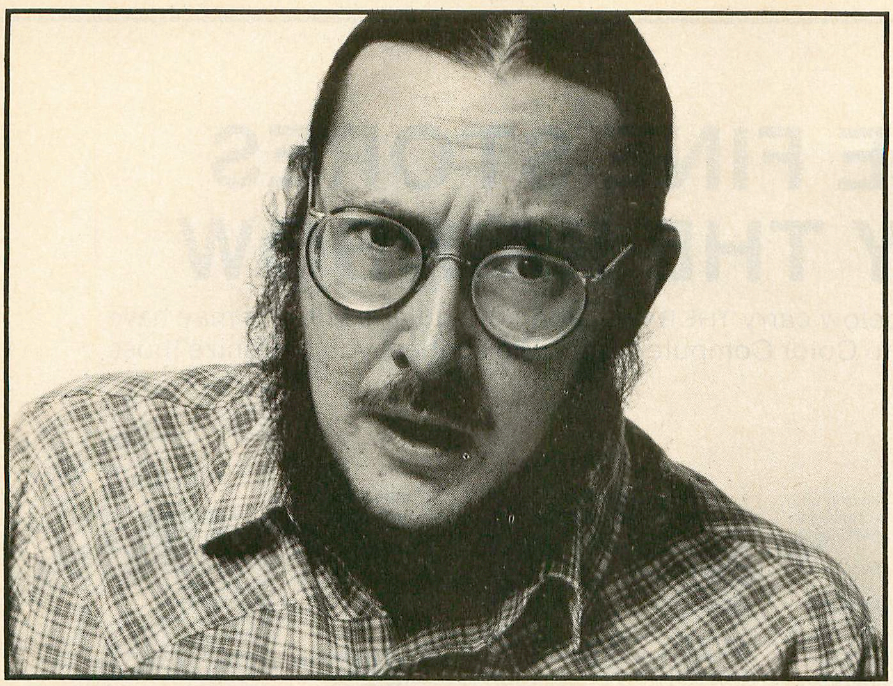
Scott Nelson
Stoughton, MA

Scoreboard:

I have scored 220 in 236 turns in *Pyramid* by Radio Shack and I thought I would send in a hint. If you carry two treasures and let the mummy take them, you can carry many treasures after that, which lessens your trips back to the entrance. When you find the chest in the maze, the other two treasures will be there.

I need some help in draining the pool in *Sands of Egypt*. If you can help, write me at 809 S. Emerald Dr., 33037.

Pat McWhinney
Key Largo, FL



DON'T GET BURNED

THE COLOR BURNER FROM GREEN MOUNTAIN MICRO

Lately I've been hearing that you want to program erasable read-only memories (EPROMs). It seems you want to create your own program cartridges, or make changes to your Basic ROMs, or turn your CoCo into some different animal.

The problem is, most EPROM programmers cost over $100, and $100 is big dues to pay. You want to burn EPROMs, not get burned in price — or quality.

So, I've put together the Color Burner, an EPROM programmer that will burn all the "27" family — 2716, 2732, 2764, 27128. Yes, it will also burn 68764 replacements for your Basic ROMs and, no, it won't break your budget.

Although my Color Burner doesn't cost a whole lot, you won't get burned over quality. I don't cut corners in hardware. I use the best fiberglass boards, with gold edges, protective solder masking and silk-screened legends. Before I send you a Color Burner, I test it by actually programming an EPROM.

So how can it be good if it's so inexpensive? First of all, you can only get a Color Burner from Green Mountain Micro. No dealers are adding to its price. Second, it isn't fancy. No high-tech power supplies are in sight. You've got to add three homely, low-tech 9-volt batteries to get it going. Finally, it won't set new standards of complexity. It's simple, hardworking and reliable.

You can get your Color Burner complete or *a la carte*: try an assembled and tested unit, a kit, or just a bare board. Order it with or without programming software. Both kits and assembled units come with over 40 pages of documentation, complete program listings, and schematics. Nothing is hidden.

You'll burn those EPROMs, you won't get burned, and my technical support staff will keep you from getting burned up if you have a question or need help.

You Won't Get Burned with The Color Burner

- Assembled/tested with software, $69.95.
- Assembled/tested only, $64.95.
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- Board/documentation with software, $30
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- 2716 and 2732 EPROMs available.

Specifications:

Programs 24/28-pin EPROMs, providing 21/25-volt programming pulses under software control. Includes unwired personality module. Requires three 9-volt batteries (not included). Tape software supports 2716 through 27128 and 68764/66 EPROM families, and requires 32/64K Extended Color Basic.

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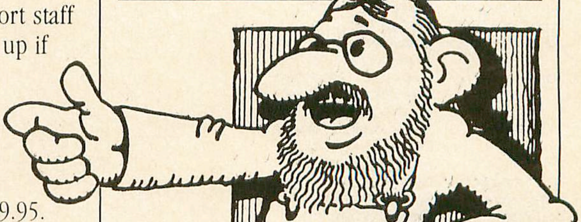

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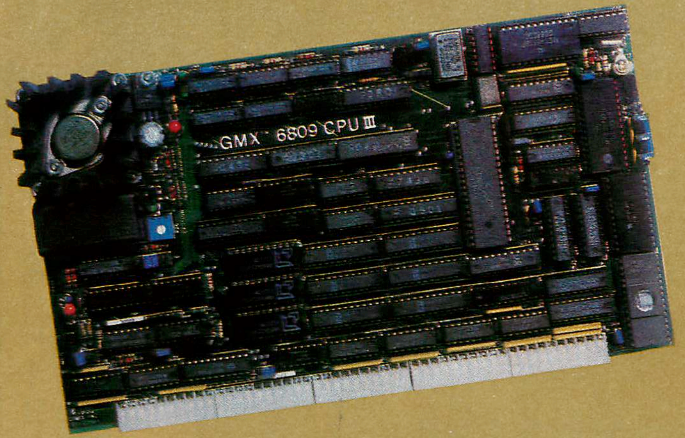

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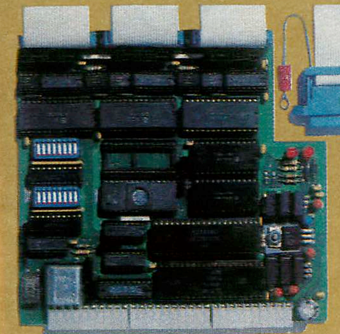

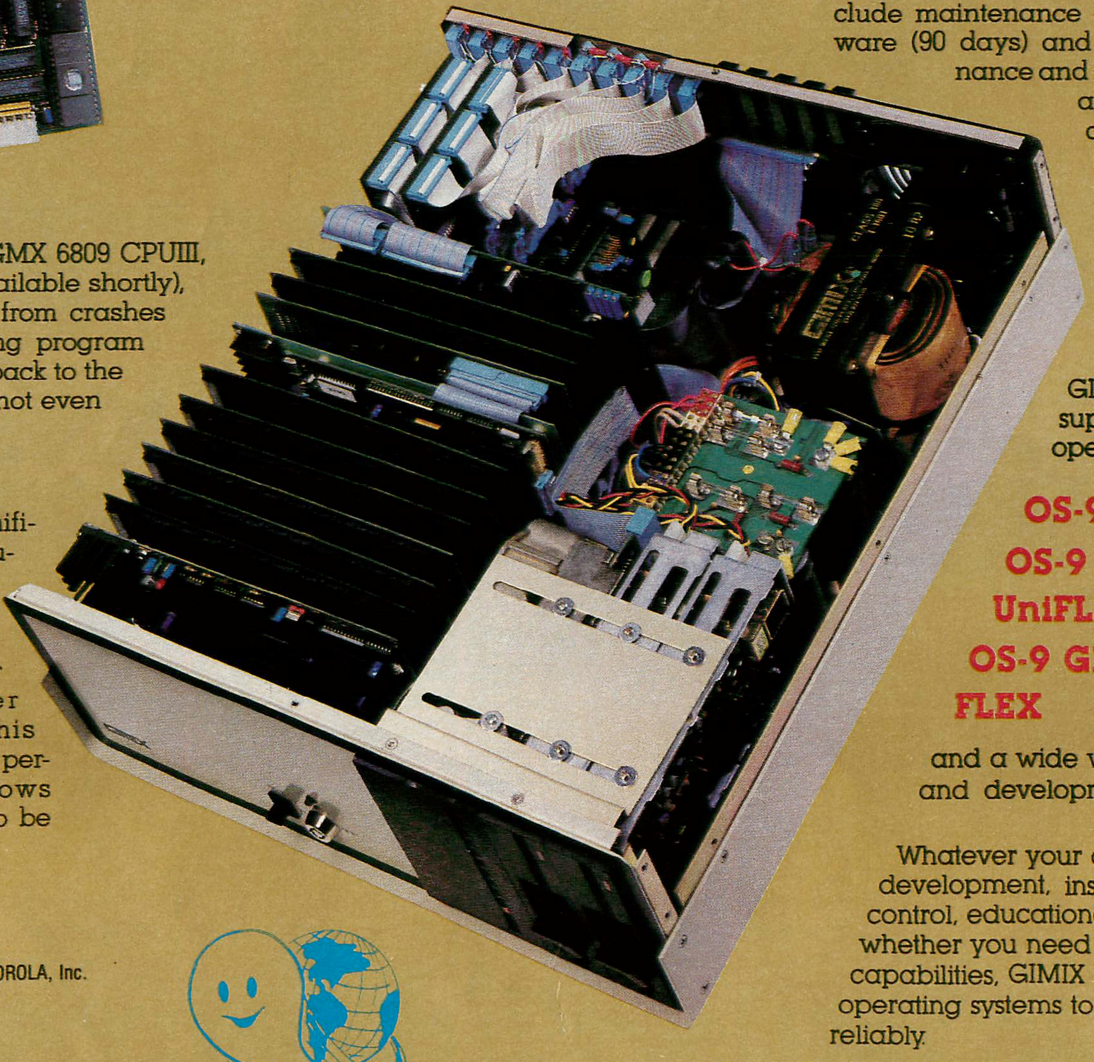

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OS-9 GMX III,
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